ROLE OF THE STATE IN INFRASTRUCTURE PROVISIONING FROM 1880S TO WORLD WAR I: TELECOMMUNICATIONS INFRASTRUCTURE IN EUROPE

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Role of the State in Infrastructure Provisioning from 1880s to World War I: Telecommunications Infrastructure in Europe1

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ABSTRACT

The telecommunications industry, as provider of essential infrastructure, generator of welfare and promoter of freedom of speech, has experienced a series of dramatic changes since its beginnings in the late 19th century. Being initially a sector with a wide range of different forms and structure types, telecommunications have gradually developed into a public-owned industry without competition. However, in the past several decades, following the latest liberalisation and privatisation wave worldwide, the telecommunications industry has become an increasingly dynamic environment with a great potential for further growth. Nevertheless, in many countries the state has asserted its strong position within the sector regardless of the proceeding liberalisation process. Against this backdrop, the aim of the paper is to investigate the role of the state in the provisioning and financing process regarding telecommunications infrastructure in Europe from a cross-temporal perspective. To answer this question a cross-country analysis will be applied by comparing different political and institutional patterns across the European Union. By investigating telecommunications infrastructure projects across time periods, the paper aims at identifying different industrial structures that have emerged within the industry at the end of the 19th century and the beginning of the 20th century and, hence, analysing the corresponding role the central authority had played in providing telecommunications services.

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KEYWORDS: Telecommunications infrastructure, financing, provisioning.

JEL Codes: N13, N43, N73, O18, O33, O38, L96

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1 Introduction

Ever since Johann Philipp Reis’s and Alexander Graham Bell’s time, the telecommunications industry has been regarded as a trailblazing one, providing essential infrastructure, generating welfare, promoting freedom of speech and communication of thought. The industry has experienced a series of revolutions since its inception in the late 19th century. Initially, a sector with a wide range of different forms and structures ranging from state-owned monopolies to fully competitive and open market structures, telecommunications gradually evolved into a relatively stable state-owned industry in the mid-20th century on a near global scale. However, in the past several decades especially since 1980s, following a wave of liberalisation and privatisation processes worldwide, the telecommunications industry has become an increasingly dynamic environment with a great potential for further growth due to increasing competitiveness and anti-trust regulation.

Nevertheless, nowadays in many countries the state continues to hold a strong position within the sector despite the on-going privatisation process. Many governments are apprehensive about a sweeping liberalisation process, stressing that a completely privatised market would immediately lead to higher consumer prices and underserved rural areas. Also, many governmental officials advocate a strong state voice within the industry, “[…] believing that liberalized markets are untested in telecommunications”.4

However, the current trend towards a fully open and privatised telecommunications industry does not represent uncharted territory and this is the subject of today’s treatise. In order to understand today’s structures, it is necessary to understand the past. Digging deeper into the history of telecommunications, we may recall that private telecom companies (primarily, the US Bell telephone company through its subsidiaries) brought telephone services to the world at the end of the 19th century.5 Hence, private provision was a self-evident proposition at the end of the 19th century. A sea change occurred when countries began nationalising the sector soon after (e.g. Germany, France) reflecting the desire of central authorities to control the conveyance of information and thereby protect the national interest, especially in the wake of the two world wars.6 Others such as e.g. Scandinavian countries actively encouraged private competition and provision of telephony services from the very beginning.7 Even in these not overly regulated environments, the state did not fully refrain from participating in the provision of telephony services: In Denmark, for instance, the state was involved in the construction of long distance lines, but stayed out of the telephony business. Whereas in Norway, Sweden

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and Finland, there have been state-owned companies competing with private ones but carving out no significant market share. Against this backdrop, it soon becomes apparent that different industrial structures emerged within the industry across the globe in order to implement Reis’s trailblazing innovation at the end of 19th and in early 20th century.

Following this, the aim of the paper is to investigate the role of the state in the provisioning and financing process in the telecommunications infrastructure across time. The study considers primarily the period from 1880s to World War I analysing early developments in this dynamic and innovative industry. The reason for focusing on this time period is related to the fact that the present wave of privatisation and market liberalisation does not represent a completely new phenomenon in terms of telecommunications. It is rather a “return to its roots”. Pertinently, it is very important for today’s discussions and the still on-going restructuring process of the industry towards fully private provision to have an in-depth understanding of how effective (or ineffective) early attempts to regulate the telephone sector were. Furthermore, as mixed competition structures were present in the first development phase of the industry, after World War 1 the telecommunications industry developed successively and almost globally into a state-owned industry without competition. Thus, focusing on this particular period enables a comparative, performance-oriented analysis of differing industrial structures and regulatory approaches within the telephone sector in Europe. Hence, the paper will not consider post-World War I developments when the trend towards nationalisation and monopolisation began nor the post-World War II period when privatisation and liberalisation in contemporary telecommunications started.

Furthermore, this analysis considers the main factors for establishing variant industry structures across Europe which range from full government provision (France, Germany) to private provision in an open environment (Scandinavia) to private provision under strict regulation (UK, Italy, Spain). Moreover, a cross-country analysis is applied by comparing different political, institutional and market patterns across Europe at the end of the 19th and at the beginning of the 20th century, analysing the corresponding role the central authority played in providing telecommunications services. Furthermore, the paper focuses on the impact government provision and regulation had on telephone services (prices, quality of services, rural service, telephone penetration, and long-distance prices). In this sense, historical data from several sources are distilled and applied in order to address the question: Should the government provide telecommunications services and if not, what regulatory constraints— if any—should be introduced in a privately run market?

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8 Ibid. See also Wallsten, (2001). P. 6f.
The structure of the paper is as follows. Section 2 provides a brief introduction to the field of communications infrastructure focusing on its important role in socio-economic and geopolitical issues before dealing with the early developments in the telephone and telegraph industries across Europe. Section 2 also provides an insight into the impact that the provisioning of telegraph services and the role of the state had on the market structure of the telecom industry across Europe. At this point it is necessary to emphasise that the early structure of the telecommunications sector in almost all countries was less a reflection of a welfare maximising policy and more a result of how countries had organised its telegraph industry and what importance it had on the political agenda.\footnote{See Wallsten, (2001). P. 2.} Section 3 analyses differing structures of the telephone industry in the European context. At this juncture, the cross-country analysis is applied by comparing different political, institutional and market patterns in several European countries. In the next section, the paper discusses the impact that government provision and regulation had on telephone services and its effectiveness on telecommunications network establishment. In this context, the emphasis is on the question: What do performance studies of public and private ownership reveal? Finally sections 5 and 6 contain some preliminary conclusions and comment on the relevance of this research for the contemporary insight.

2 Communications infrastructure as a means of power and control

Similar to electricity, gas and water supply, telecommunication plays a crucial role in modern times. Many scholars have analysed this important technological innovation focusing not only on the economic growth impact, productivity and welfare in general, but also on its role in promoting freedom of speech and facilitating and stimulating democratisation processes throughout history.\footnote{See, for instance, Solow, (1956), Röller and Waverma, (2001), Shirazi, (2008).} From the present point of view, it is self-evident that telecommunications technology and infrastructure opened a completely new way of communication, enabling people to connect and cooperate more efficiently and faster, and impacting and fostering economic development in a variety of ways.\footnote{See Pennings et al., (2005). P. 4.} Even the well-known Solow-Paradox that remarkable innovations in modern technology could statistically produce only a relatively slow growth of productivity at the level of the whole economy, is proven wrong from today’s perspective.\footnote{See Brunetti, (2008). P. 6.} However, in order to benefit fully from this great innovation, a significant number of people had to use the telephone and hence connect to other users (network externality or network effects). This economic principle indicates that the total value and benefit of a product (e.g. telephone) increases with the number of other users using the same product.
terms of telephone this also means that some sort of unified service is needed in order to maximise the benefits.\textsuperscript{14}

The introduction of the telephone at the end of the 19\textsuperscript{th} century generated a high public demand in many countries and the number of possible connections increased exponentially with the number of connected telephone devices. A side-effect of this development was that manual switching became more costly with network size.\textsuperscript{15} In order to have an effective use of the telephone an extensive and robust infrastructure was indispensable and had to be constructed from scratch, which required enormous and rather risky investments. As a necessary consequence, these infrastructure projects were implemented by the State. Hence, a strong state presence within the industry may be discerned globally and throughout the history. Even nowadays in many countries the state continues to hold a strong position within the sector despite the on-going privatisation process. In Germany for instance the central authority is still a minor shareholder of the incumbent Deutsche Telekom (today the state owns 14.96 \% of shares in the company)\textsuperscript{16}. In many countries \textit{inter alia} France, Ireland, Sweden, Netherlands, Belgium or Italy we can find similar developments.\textsuperscript{17}

In scholarly writings, public ownership in telecommunications has often been advocated as an instrument to correct market failures. Millward (2010) argues that the political ideology, in terms of socialism versus capitalism, has hardly played any part in explaining the reasons for state ownership in the field of telecommunications. Instead, he observes, it was likely the fact that telecommunications have at least two technical features:\textsuperscript{18} (1) Telecommunications were considered as natural monopolies until the late 1980s and were usually provided by a single state-owned company, which was subject to arms’ length regulation almost everywhere except in USA. In the States, on the other side, telecommunication services have been provided by private monopolies, which were regulated by the state.\textsuperscript{19} (2) A probably more striking and convincing feature regarding the desire of central authorities to control the conveyance of information lies in geo-political factors such as inter alia resource endowments, social and political unification, and internal and external security. Telecommunications embodies an essential infrastructure to the State and its protection and warranty of a secure transmission of valuable information, especially in the wake of the two world wars, represented along with telegraph systems a crucial national interest in terms of security concerns.\textsuperscript{20} Hence, public ownership was often preferred over regulation and subsidies to private providers in order to

\textsuperscript{14} For a more detailed analysis of network externalities see, for instance, Katz & Shapiro, (1986).
\textsuperscript{16} See DTAG, (2012).
\textsuperscript{17} See Millward, (2010). P. 14.
\textsuperscript{18} Ibid. P. 4.
\textsuperscript{19} See Wallsten, (2005). P. 693.
accelerate the development of extensive telephone infrastructure and ensure tight control over the transmission of information. In some countries, like Sweden and France, an additional reason for significant government involvement was the shortage of private capital which led to insolvencies or notable delays in the construction process of telecommunications infrastructure.\(^{21}\)

Nevertheless, probably the most determining factor when discussing the sector structure of the telecommunication industry and the role of central authorities in late 19\(^{th}\) and the beginning of 20\(^{th}\) century was the organisation of country specific telegraph industry and how they viewed the telephone relative to telegraph services.\(^{22}\) In other words, countries where the telegraph architecture was characterised by state ownership and where governments have had a large financial stake in the telegraph were understandably reluctant to introduce competition and private ownership in the telephone industry. They perceived telephony as a threat to their “well-structured” profit and influence generating telegraphy.\(^{23}\) Since the mid-19\(^{th}\) century, the majority of European countries governments had been developing electrical telegraph networks for military and geo-strategic purposes even though strict laws prohibiting competition and private ownership in that area were not extant. The Scandinavian countries, particularly Sweden and Denmark, did not pursue state ownership in the sector of telegraph services even though the Danish government even retained a legal right to provide monopoly telegraph services.\(^{24}\) Sweden on the other hand adopted a legal framework stimulating competition and prohibiting the state from establishing a monopoly in the field of telegraphy.\(^{25}\)

In the rest of Europe the state took a much more hands on approach to telephony. At the end of the 19\(^{th}\) century, private telecom companies (primarily, the US Bell telephone company through its subsidiaries) introduced telephone services to Europe offering for sale the new technology to Government Telegraph departments. In Great Britain, Austria, Belgium and France, for instance, the telegraph departments did not want to take the risk of establishing a completely new business. Instead, they issued licenses to private companies for restricted periods of time and under rigorous conditions providing the state with the exclusive right to take over those services if it became apparent that there was an insatiable public demand for it.\(^{26}\) Countries including Germany, Switzerland, Bulgaria and Luxembourg established state-owned monopolies immediately perceiving huge potential benefits of telephony.\(^{27}\)

Against this backdrop, it soon becomes apparent that different industrial structures emerged within the industry across the globe in order to implement telephone networks at the end of 19th and in early 20th century. Hence, Section three analyses the discrete structures of the telephone industry in the European context. At this juncture, the cross-country analysis is applied by comparing different political, institutional and market patterns in several European countries.

3 Main structural paths of telephone industry across Europe

As discussed in the previous section, European countries had differing approaches towards the telephone industry at the end of the 19th and the beginning of the 20th century. In most cases the existing structures in telegraph sectors had a striking influence on the initial organisation of telephone industries. Thus, three industrial structures emerged within the industry throughout Europe at this time. The Scandinavian countries pursued an open approach that encouraged private ownership and competition in the field of telephone from the very beginning. In these countries private companies had a free hand in investing and establishing their own networks. Other states, like Great Britain, Spain or Italy, indeed, allowed private telecom firms to enter the market and provide telephone service. However, these companies operated under onerous regulation and were forced to enter strict concessionary agreements with national governments. Countries like Germany, France and Switzerland established state monopolies although the rationale behind that decision varied between the countries. The following section analyses these differing structural approaches in more detail (see Table 1).

<table>
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<th>Table 1: Industrial structures of telecommunications industry in Europe at the end of 20th century</th>
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Source: Own illustration

3.1 Private Provision in an open environment: Scandinavia

As briefly stated above, since the introduction of telephone Scandinavian countries have advocated an open and fierce competition amongst private companies. Although in some cases (e.g. Sweden, Norway and Finland) state-owned companies competed with private telecom
providers, the state-owned company did not exert any significant market power. Hence, the Scandinavian approach to telecommunication policy appeared to be one designed to promote telephony. Indeed, this region is recognised as a global leader in the field of telephony not only at the beginning of the 21st century but throughout history. In line with this, performance studies of public and private ownership (see section 4) reveal that Scandinavian countries with their open and liberal approach towards private ownership and provision had the highest telephone penetration and also a better telephone service considering rural areas across Europe through the entire period at issue.

**Sweden**

From the outset, Sweden adopted a legal framework that stimulated competition and prohibited the state from establishing a monopoly in the field of telegraphy. Furthermore, the Swedish parliament held strong fears about possible detrimental service accompanying a state-monopoly and prohibited the state from buying out private firms and establishing a strong, state-owned monopoly until 1918.

The subsidiary of the Bell Company introduced telephone services in Sweden by opening several exchanges in the biggest cities in 1881. This fostered competition and resulted in local cooperatives entering the market. By 1920 around 200 private telephone companies were active in Sweden. Founded as a local cooperative, the General Telephone Company developed into a major market player and soon acquired the subsidiary of the Bell Company. The State was prohibited from establishing a monopoly and from purchasing private firms. However, it did open a competing exchange in Stockholm. At this time, the main responsibility of the Swedish government (through the state board, Televerket) was to build and maintain trunk lines connecting independent local private exchanges as private companies were faced with difficulties in ensuring private finance for developing long-distance lines.

**Denmark**

In Denmark, a somewhat similar situation existed to the extent that the Danish government focused on the development and operation of trunk lines connecting private exchanges.

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29 See Webb, (1910). P. 73. See also Bennett, (1895). P. 130.
30 Section 4 discusses this matter in more detail.
Nonetheless, it initially refrained from entering the telephone business.\textsuperscript{36} Other developments also resemble to those in Sweden: the subsidiary of the Bell Company introduced the first exchange in Copenhagen in 1880 before selling it to Copenhagen Telephone Company in 1882.\textsuperscript{37} As stated earlier, the Danish government even retained a legal right to provide monopoly services in the field of telephony and telegraphy. However, it did not pursue state-ownership in those sectors and concentrated solely on building long-distance lines in competition with private network operators.

**Norway**

Similar to Denmark, the Norwegian government retained the statutory right in 1881 (Telephone Act) to establish a monopoly in telegraphy and telephony. According to this Telephone Act, privately-owned national telecommunication networks were prohibited if the government assumed these networks would threaten national financial revenues within the sector of telegraphy.\textsuperscript{38} However, this law also enabled the government to grant concessions to private operators (usually for five years). Initially, the Norwegian state did not fully promote and support competition and the private provision of telephony but ultimately, it did not hamper further private developments. There were, however, some early initiatives to protect the telegraph industry by prohibiting local telephone systems from coming within two kilometres of each other.\textsuperscript{39} These restrictions were soon lifted as private operators found ways to circumvent them.

As was the case with Sweden and Denmark, the subsidiary of the Bell Company introduced exchanges in Christiana and Drammen in 1880. These exchanges were soon sold to Christiana Telephone Company and Drammen Uplands Telephone Company.\textsuperscript{40} The latter began extending its services to rural areas outside the town with remarkable quality showing that even sparsely populated areas can be provided with telephone services and maintained at a considerable profit.\textsuperscript{41} Also very similar to other Scandinavian countries is that private telephone networks in Norway were restricted to towns whilst the state-owned Telegrafslyret was responsible for building a national network (completed in 1920).\textsuperscript{42}

\textsuperscript{38} Ibid. P. 38.
\textsuperscript{40} See Wallsten, (2005). P. 701.
\textsuperscript{41} See Bennett, (1895). P. 281.
\textsuperscript{42} See Millward, (2010). P. 15.
3.2 Private Provision under strict regulation (concessions): Great Britain, Italy, Spain

The second group of countries showed a significant overlap with the first group in that they acknowledged the importance of an open and competitive market environment. Nonetheless, this second group of countries, including inter alia Great Britain, Italy, Spain, only allowed private companies to participate in the market subject to onerous regulation conceding to the government the right to take over private firm’s assets with no compensation.43

Great Britain

Prior to the introduction of the telephone in Great Britain, the country had a nationalised telegraph system which enabled the General Post Office (GPO), the state postal system and telecommunication carrier, to establish a legal monopoly of communications by electricity in 1869.44 Hence, the first attempt to introduce telephony in UK occurred when the Bell Company tried to sell patent rights to GPO which failed due to problems of getting authorisation for the expenditure from the public purse. In this context, Foreman-Peck (1985) noted: “This reluctance to commit state money for large scale investment has been the one stable feature of UK telecommunications policy, and coupled with substantial state ownership and control, accounts for many of the industry’s long term failings”.45

In 1880, the Bell and Edison subsidiaries merged establishing United Telephone Company (UTC).46 Despite the fact that this private operator was granted a monopoly concession, it operated in a very restrictive political environment. As stated before, the British government had nationalised its telegraph system and adopted a protectionist stance to safeguard its financial stake in that sector. In line with this, UTC was subject to GPO control and was obliged to pay 10% of its gross earnings to GPO.47 The government also had the statutory right to buy the telephone system at an undefined price in 1890. These legal restrictions towards private concessions were tightened further when revenues in the telegraph industry started to fall in 1882 leading the government to prohibit UTC from building public call boxes and granting GPO the right to buy as many telephones from UTC as it wanted for a price defined by arbitration.48 However, as the prevailing innovation of telephone with all its benefits had rapidly achieved a strong foothold within British society, the government was somewhat forced by public pressure to revise its telecommunication policy in 1884 with the em-

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phasis on creating competition within the industry. Hence, rules were introduced allowing municipalities to receive additional concessions.\(^4^9\)

However, this new regulation failed to stimulate sufficient competition. Wallsten (2005) offers several explanations for this failure.\(^5^0\) First, a reorganisation of the UTC into National Telephone Company (NTC) occurred, hampering competition to a reasonable extent. Due to the fact that NTC were awarded regional concessions covering several municipalities, local private and municipal companies were of the view that they would have to provide services collectively in order to succeed in the market. Second and perhaps more strikingly, all concessions were set to expire by 1911 with no agreement on “where to go from here”. As a consequence, NTC stopped signing up new customers justifying this strategy on the need to recoup all of its investments by 1911. Hence, many potential customers were not connected to the telephone network.

**Italy**

As far as Italy is concerned, the telephone had been introduced in 1877 and was initially regulated by the *Baccarini decree* from 1881.\(^5^1\) This legislative measure resembled to a great extent the regulatory practice conducted in Great Britain at that time in terms of telephony. Both jurisdictions applied the so called *telegraphic paradigm* that stipulated that the governments’ primary goal was protecting investments made in the telegraph industry and, hence, safeguarding central authority’s financial stake within telegraphy, thus stultifying developments in the telephone sector.\(^5^2\) However, the Decree provided for private provision and the establishment of private telephone networks in the field of telephony though the concessions granted under it were very restrictive. In this context, the government reserved the right to force telephone companies to make modifications when they seemed necessary in order to protect the telegraph industry.\(^5^3\) These adjustments would have to be undertaken at the private telephone provider’s own expense. Furthermore, the licences were granted for up to 25 years. However, they could have been suspended at any time meaning that those agreements were completely uneconomical due to high uncertainties in terms of long-term business planning induced by such onerous regulation. Additionally, at the end of the licensing period all the equipment (telephone networks, exchanges etc.) had to be handed over to the central government without compensation.\(^5^4\)

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\(^{5^1}\) See Balbi, (2011). P. 1059.


Interestingly, the Italian government was keen on promoting competition amongst telephone providers by granting several concessions in the same city and by licensing each private company for only a small urban network. In other words, several private companies were managing several networks within one urban area which were not connected to each other and their subscribers could not communicate with customers of competing companies. Finally, private companies were not allowed to establish long-distance networks. At the end of the 19th century, the Italian government did not consider long-distance networks as strategically important and, hence, it did not invest public money in its development nor did it allow private companies to do so. This government’s stance changed initially at the start of the new century leading the central authority to pass a law in 1903 that promoted long-distance networks’ extension though completely by private companies.

Spain

In contrast to Italy and UK, Spain experienced a much more progressive approach to telephony in terms of private provision. However, an early attempt to introduce the telephone in Spain resulted in a law from 1884 which designated the government as the sole provider of telephone services. Nonetheless, this law was amended in 1886 enabling private players to enter the market and subsequently engage in fierce competition with each other over telephone service provision. According to Bennett (1895) the main reason for such a volte-face on the part of the Spanish government regarding the structure of the telephone sector in the 19th century was primarily the belief of the Spanish authorities that the State did not have the capacity or means to establish and maintain telephone infrastructure to fully meet public needs. Therefore, policy dictated that, private companies should be entrusted with developing telephone networks and providing telephone services whilst adapting to public requirements. In similar fashion to the UK, Spanish companies also had to pay royalties to the State. These royalties, however, were not fixed but rather the subject of the bidding process within the auction for granting concessions. As a result, the state granted 35 concessions with the agreed royalties ranging from 10% in the cities of Valladolid, Seville, Granada and Alicante to 34% in Bilbao. An additional similarity to the UK and Italy was also the statutory right allowing the State to take over the whole network at the end of the licensing period (20-year concession) without compensation. As a consequence, private operators (same holds true for Italy and UK which were also characterised by such an institutional setup) were indi-

56 Ibid. P. 1064.
57 Ibid. P. 1065.
59 See Bennett, (1895). P. 323.
60 The minimum allowed bid was 10%. See Wallsten, (2005). P. 700.
61 Ibid.
rectly forced to raise their prices in order to recoup their investments under the threat of expropriation. This inevitably led to a much higher price levels for telephone services in these three countries than in the rest of Europe (see the next chapter for a comparison of price levels amongst selected European countries for the period at stake).\textsuperscript{62}

### 3.3 Full government provision (government monopoly): Germany, France

Finally, the third most common structural path of telephone industry in Europe at the end of the 19\textsuperscript{th} century was characterised by a monopolistic provision usually involving a state-owned telecom company. These countries (inter alia Germany and France) generally, perceived telephony as a threat to their established and profit-making telegraph sector (as discussed above) and intended to safeguard their financial stake within the telegraphy by placing the emerging novel technology under the authority of the telegraph agency.\textsuperscript{63} Hence, the countries from the third group were reluctant to invest in telecommunication infrastructure retarding the development of the sector and leading to worse outcomes (in terms of quality of service and penetration of the telephone) than was the case in countries with a somewhat open and progressive approach towards telephony.\textsuperscript{64}

**France**

When considering government ownership in telecommunications, France represents a prime example of how inefficient and regressive state telephone systems were. Initially, the French government allowed private telecom companies to operate on the French telecommunication market and granted concessions respectively. These licences were, however, linked to very restrictive and onerous statutory requirements and of short tenure – usually four years.\textsuperscript{65} The reason for allowing private companies to operate, however, only under strict regulation, is linked primarily to the fact that French authorities were keen on protecting revenues from the public telegraph system.\textsuperscript{66} Also, the State did not perceive the novel technology as an important geo-strategic asset at that time, hence, the public provision was not even considered until 1889.\textsuperscript{67} As an example, the networks in Paris, Rouen, Le Havre and many others were developed by Société générale du Téléphone (SGT) in 1879.

In 1889 the French state nationalised all private network in a quite brutal manner ending this liberal period in the French telecommunications history. One of the main reasons for this development was to break the monopoly of for the private telecom provider which was accom-

\textsuperscript{62} For a more detailed analysis of this issue see Keefer, (1996).

\textsuperscript{63} See Wallsten, (2005). P. 703.


\textsuperscript{67} Ibid. P. 160.
panied by increased telephone service prices and diminishing performance quality.\textsuperscript{68} Nonetheless, the nationalisation process did not bring any radical quality improvements as hoped for by the government. The penetration rates remained low while the prices high.\textsuperscript{69} The French government justified high prices as a necessary evil in order to restrict the rapid increase of subscribers until a more robust infrastructure could be built. However, the State was laissez-faire in building additional facilities. Urban areas that required telephone networks had to provide financial means in order get those networks built. So, local banks needed to be involved in providing necessary financial funds which, on the other hand, were primarily interested in lines to Paris not financing local networks.\textsuperscript{70} As a consequence, the French telephone system remained underdeveloped: By 1914, France had one of the lowest telephone penetration rates in Europe of only 0.8 devices per hundred inhabitants compared to 4.5, 4.1 and 3.4 in Denmark, Sweden and Norway respectively (see Figures 2 and 3).\textsuperscript{71}

\textbf{Germany}

The initial German approach to telecommunications was somewhat different from other countries meaning that the telephone was introduced in a two-stage process:\textsuperscript{72} First, the telephone was officially introduced in 1877 by the German Postmaster General Heinrich Stephan in order to expand telegraph services to rural areas. Moreover, the telephone was regarded as a complement to the technically more sophisticated telegraph system, but there was a failure to generate substantial demand for the new-fangled invention. Two years later the second stage occurred when Bell applied for a concession to establish private telephone networks. However, the German Post Office refused to grant the telephone license to the International Bell Telephone Company arguing that it was an unsophisticated technology and would be incompatible with the more advanced telegraph system.\textsuperscript{73} Furthermore, the government feared that permitting Bell’s Company to develop and operate telephone networks in Germany would inevitably impose a threat to State’s finances and shift the political and economic power to a foreign company. Hence, it “[...] decided to interpret the legal situation of the telephone as being part of the existing state monopoly on telegraphy that was fixed by the Constitution”.\textsuperscript{74} As a consequence, further developments of the telephone system in

\textsuperscript{68} Ibid. P. 161.
\textsuperscript{69} See Wallsten, (2005). P. 703.
\textsuperscript{73} Ibid. P. 180f.
\textsuperscript{74} Ibid. P. 183.
Germany were hampered as the central government invested little in its own telephone system beyond its function as a complement to the telegraphy.75

However, the German telecommunications infrastructure was not only lacking excessive capital. The Federal State did very little to stimulate public demand for this novel technology. So it adopted a law in mid-1890s that prohibited individuals from sharing a phone which could lead to a 6-month prison term.76 Furthermore, the German government was not keen on introducing new technologies in the very dynamic field of telecommunications meaning that German telephone system was struggling to keep the pace of global developments.77 As a result, the German telephone system suffered low penetration rates and relatively poor local services in comparison to other European countries of that time.

Summary
As we have seen in this chapter, there were mainly three differing approaches to the telephony in Europe at the end of the 19th and the beginning of the 20th century. Hence, the role of the state in the provisioning and financing of telecommunications infrastructure varied widely when considering the aforementioned European countries in the time frame at stake. In many cases, it was the sector structure in the field of telegraphy that was the major factor when deciding what regulatory approach to adopt for the telephone system. But, there were also very important country-specific characteristics that finally led to the adoption of a certain market structure. Nevertheless, the outcomes in terms of inter alia quality of telephone services, prices, telephone penetration rates, rural services differed among European countries drastically. Hence, the following chapter 4 is dedicated to performance studies of public and private ownership in terms of the aforementioned parameters. In this sense, historical data from several sources are distilled and applied in order to address the question: should the government provide telecommunications services or do open markets generate better outcomes in the field of telecommunications?

4 Effects of government provision and regulation on telephone services and prices

The historical exposition in the previous section discussing the introduction of the telephone systems in Europe and the role of the State within the telecommunications industries reveals a vast variety of different motives and approaches. The emergence of state enterprises and

75 The investments in the telephone infrastructure were limited to long-distance lines in order to improve countrywide telegraphic communications.
regulation in the field of telecommunications was often prompted by issues of internal and external security – frequently concerning social and political unifications, especially in new or fragile nation states.\textsuperscript{78} The general argument for the establishment of state enterprises in this field was that they were capable of performing more efficiently in terms of providing telephone services – especially in terms of rural and remote scarcely inhabited areas – than private providers. Hence, the following chapter analyses the effects of differing sector structures on the performance parameters (prices and services, rural service and telephone penetration) in the telephone industry. For this reason, the existing performance studies of public and private ownership in the field of telecommunications are thus evaluated and summarised in the following chapter. At this point it is necessary to state that although the main structural paths of telephone industry across Europe (as discussed in the previous chapter) differ from country to country, for the analysis at stake it seems reasonable to neglect all the country-specific conditions and merely consider the three distinctive industry structures: private provision in an open environment, private provision under strict regulation and government provision through a nationwide state-owned monopoly (see Figure 1).

\textbf{Figure 1: Industry structures and the analysed performance parameters}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{industry_structures}
\caption{Industry structures and the analysed performance parameters}
\end{figure}

Source: Own illustration

\textsuperscript{78} See Millward, (2010). P. 15.
4.1 Telephone services and prices

The remarkable evolution of communications technology and the subsequent convergence of different technologies and industries, as witnessed today, render modern telephone lines capable of transmitting more than just voice signals in line with similar developments that transpired over more than hundred years ago. Of course, this statement is amounts to a slight exaggeration given that the comparatively basic and rudimentary telecommunications infrastructure at the turn of the 20th century is in no way comparable to today’s technically mature and sophisticated communication networks. Nonetheless, even in the early days, of the telephony, telecom providers’ product portfolios contained a relatively wide array of different services. Table 2 shows prices for different services, including some basic ones as for connection and subscription for selected European countries. It considers also some additional services that go far beyond the usual person-to-person communication. Therefore, at the end of the 19th century services like telephonograms\textsuperscript{79}, telephoning telegrams or telephoning mail\textsuperscript{80} existed in many countries.

Table 2: Services and Prices, Selected European Countries, 1895

<table>
<thead>
<tr>
<th>Country</th>
<th>Entrance Fee (pounds)</th>
<th>Annual Subscription (pounds)</th>
<th>2nd Connection Charge (pounds)</th>
<th>Internal Trunk Rates (pence)</th>
<th>Telephoning Telegrams (pence)</th>
<th>Telephonograms (pence)</th>
<th>Pay Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bavaria</td>
<td>0</td>
<td>7.5</td>
<td>7.71</td>
<td>5</td>
<td>20</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Denmark-private</td>
<td>0</td>
<td>8.3</td>
<td>8.7</td>
<td>0</td>
<td>0</td>
<td>0.131</td>
<td>0</td>
</tr>
<tr>
<td>Denmark-state</td>
<td>0</td>
<td>8.3</td>
<td>8.7</td>
<td>20.4</td>
<td>81.7</td>
<td>2.6</td>
<td>0</td>
</tr>
<tr>
<td>France</td>
<td>0</td>
<td>16</td>
<td>16.3</td>
<td>4.8</td>
<td>19.2</td>
<td>480</td>
<td>4.8</td>
</tr>
<tr>
<td>Germany</td>
<td>0</td>
<td>7.5</td>
<td>7.8</td>
<td>8.3</td>
<td>33.1</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Italy</td>
<td>0</td>
<td>5.4</td>
<td>n/a</td>
<td>29</td>
<td>29</td>
<td>1.92</td>
<td>n/a</td>
</tr>
<tr>
<td>Norway</td>
<td>0</td>
<td>4.4</td>
<td>4.6</td>
<td>3.3</td>
<td>13.2</td>
<td>2.6</td>
<td>0.1</td>
</tr>
<tr>
<td>Spain</td>
<td>0</td>
<td>8.8</td>
<td>n/a</td>
<td>8.8</td>
<td>35.3</td>
<td>n/a</td>
<td>1.9</td>
</tr>
<tr>
<td>Sweden-private</td>
<td>2.8</td>
<td>5.6</td>
<td>5.8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sweden-state</td>
<td>2.8</td>
<td>4.4</td>
<td>4.6</td>
<td>0</td>
<td>0</td>
<td>0.66</td>
<td>0</td>
</tr>
<tr>
<td>Wurtemburg</td>
<td>0</td>
<td>5</td>
<td>5.14</td>
<td>5</td>
<td>20</td>
<td>1</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Source: Own illustration based on Bennett, (1895).

Whilst the prices for the annual subscription were – except France - rather in the same range, table 2 reveals that prices varied massively for other services in Europe. In terms of internal trunk rates (5 min calls), for instance, the data set at stake discloses a price differ-

\textsuperscript{79} Telephonograms were messages sent by the subscriber via telephone to a central office that would write it down and deliver via a messenger to a non-subscriber. For more details see Bennett, (1895).

\textsuperscript{80} Telephoning mail enabled a subscriber to call a central office that would write a message down and send it via postal service as a letter or postcard. For more details see Bennett, (1895).
ence in the range of 778% across Europe (ranging from 3.3 pence for a 5 minutes call in Norway to 29 pence for the same service in Italy). For other services the data set shows similar price differentiations amongst countries at consideration. However, the wide-range of possible product and service combinations and, different price structures (similar to today’s telecommunications markets) make a comparison of services rather difficult.

Against this backdrop, it appears to be more constructive and certainly much more manageable to compare long-distance prices. Figure 2 depicts the development of long-distance prices in selected countries grouped together according to the aforementioned market structures for 1895.

**Figure 2: Average Prices for Long-Distance Telephone Calls by Sector Structure and Distance, 1895**

![Figure 2: Average Prices for Long-Distance Telephone Calls by Sector Structure and Distance, 1895](image)


Figure 2 demonstrates that long-distance prices were, in general, the highest in countries characterised by strict regulations where private telecom companies operated under the risk of expropriation (inter alia Great Britain, Italy and Spain). On the other hand, the lowest prices for long-distance services could be observed in countries with progressive and a more open approach to telephony in terms of private ownership and competition (Scandinavia). As mentioned above (see section 3.2), such an institutional set up allowing central authorities to take over privately run network systems with no compensation, certainly led to the unwillingness of private companies to invest in the infrastructure unless they would be able to recoup those investments in the short run (before their assets would be expropriated). As a consequence, private operators were indirectly forced to raise their prices in order to recoup all of their costs (fixed and marginal) threatened by expropriation. This inevitably led to much higher price levels for telephone services in these countries than in the rest of Europe.

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81 Wallsten based this figure on data from Bennett, (1895) making some initial assumptions. For more details, see Wallsten, (2005). P. 716.
4.2 Rural services

Today, one of the crucial questions, when talking about modern communication infrastructure (like e.g. broadband internet), is how to ensure nationwide access to modern communication networks. The most striking feature of this challenge is certainly the connection of rural areas with a low population density. In this context, a generally held public view is that rural areas would not be served in a liberalised and competitive market and this viewpoint advocates state intervention both nowadays as in days past. Indeed, the contemporary broadband Internet market reveals that private telecom providers are usually reluctant to invest in sparsely populated areas as “[…] expected revenues do not yet justify company investments in broadband infrastructure roll-out in rural, population-sparse areas.” Under this assumption, the rural areas are best served in countries in which a state-run monopoly provides telecommunication services to the whole country. However, Wallsten (2005) conducted a regression analysis in order to test this hypothesis in terms of telephone infrastructure at the beginning of the 20th century and received a result that surprises at first blush (see Table 3).

Table 3: Results of a regression analysis regarding rural teledensity

<table>
<thead>
<tr>
<th></th>
<th>Telephones per Hundred People Outside of Cities With More than 100,000 People</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>1.24</td>
</tr>
<tr>
<td><strong>Government monopoly</strong></td>
<td>-1.348</td>
</tr>
<tr>
<td></td>
<td>(2.71)*</td>
</tr>
<tr>
<td><strong>Capricious regulation</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.996</td>
</tr>
<tr>
<td></td>
<td>(2.02)+</td>
</tr>
<tr>
<td><strong>Population (millions)</strong></td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td>(0.37)</td>
</tr>
<tr>
<td><strong>GDP/Capita</strong></td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(3.78)**</td>
</tr>
<tr>
<td><strong>Density (population per square mile)</strong></td>
<td>-0.008</td>
</tr>
<tr>
<td></td>
<td>(3.12)**</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>-0.614</td>
</tr>
<tr>
<td></td>
<td>(0.86)</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>18</td>
</tr>
<tr>
<td><strong>R-squared</strong></td>
<td>0.76</td>
</tr>
</tbody>
</table>

+ = significant at the 10-percent level.
* = significant at the 5-percent level.
** = significant at the 1-percent level.
Notes: Robust t-statistics are in parentheses. The urban mean is 4.38.
Source: Own illustration based on Wallsten, (2005).

As indicated in Table 3, the assumption that rural areas would not be served in a competitive market structure appears to be disproved as the regression analysis reveals a highly negative effect attributed to a government monopoly on the provision of telephone services in ru-

82 For a more comprehensive analysis of the legal and economic issues in terms of rural broadband rollout, see Holznagel et al., (2010).
ral areas. Following this, Wallsten (2005) concludes: “The main reason for this is probably the large number of local cooperatives that were formed in rural areas to provide service when it was allowed. Service provided by cooperatives was often not of high quality, though presumably low-quality telephony was better than no telephony at all. In any event, it casts doubt on the argument that rural areas would be underserved in a competitive environment”.84

However, Millward (2010) casts doubt on the integrity of this conclusion by pointing to the fact that even though Scandinavian countries actively encouraged private competition and provision of telephony services from the very beginning, the state did not completely refrain from participating in the provision of telephony services. Indeed, the governments in these countries were mainly responsible for building and operating national trunk lines, a factor which should not be neglected when conducting similar analyses.85

4.3 Telephone penetration rates

Finally, in terms of telephone penetration rates (number of telephone devices per hundred inhabitants), available data for the period at issue indicate that countries which adopted open markets and competition in the sphere of telecommunications proved to be better designed to promote telephony than countries with onerous regulation and state-owned monopoly.

Indeed, figure 3 reveals that the telephone penetration grew faster in Scandinavian countries than in rest of Europe for the period 1885-1914.

Figure 3: Telephones per Capita, Europe, Selected Countries, 1885-1914

Source: Own illustration based on Bennett, (1895), AT&T, (1912), AT&T, (1913), Kingsbury, (1915) and Wallsten, (2005).

Due to the fact that income (GDP per capita) is certainly one of the most important determinants of telephone demand generally speaking, figure 4 shows the telephone penetration and GDP per capita for 1914 in selected European countries. Even though Denmark, Sweden and Norway had a lower GDP level per capita at the beginning of the 20th century (ca. 4000 dollars, ca. 3000 dollars and ca. 2400 dollars respectively) than Great Britain (ca. 5000 dollars), Germany (ca. 3500 dollars) or France (ca. 3500 dollars), they had more telephones per hundred population (4.5, 4.1 and 3.4 telephones per hundred people in Denmark, Sweden and Norway respectively compared to 1.7, 2.1 and 0.8 in Great Britain, Germany and France respectively). Hence, the figure suggests even more strongly, that countries which facilitated competition were better suited to promote the development of the telephony, despite having lower income levels than countries like Great Britain, – at that time the wealthiest country in Europe – Germany and France.

Figure 4: Telephones per hundred population and GDP per capita, Europe, Selected Countries, 1914

![Figure 4: Telephones per hundred population and GDP per capita, Europe, Selected Countries, 1914](Image)


5 Summary and conclusion

The telecommunications industry has undergone a series of transformations throughout the history reflecting its very dynamic nature. The current trend towards a fully open and privatised telecommunications industry, however, does not represent uncharted territory as we may recall that it was private telecom companies that brought telephone services to the world at the end of the 19th century. Notwithstanding this fact, in many countries around the world it was the State that often played a crucial role in providing and financing telecommunications infrastructure. The reasons for state-interventions within telecommunications – be it either through a state-owned monopoly or in its regulatory function – are manifold. Although the
fact that public ownership in telecommunications has often been advocated as an instrument to correct market failures – as telecommunications were often considered as natural monopolies leading to a single state-owned company providing services – and despite its important geo-political role especially in terms of security issues, probably the most determining factor when discussing the sector structure of the telecommunication industry and the role of central authorities in late 19th and the beginning of 20th century was the organisation of country specific telegraph industry and how they viewed the telephone relative to telegraph services. Against this backdrop, different industrial structures emerged within the industry across the globe in order to implement Bell’s trailblazing innovation at the end of 19th and in early 20th century. The Scandinavian countries pursued an open approach that encouraged private ownership and competition in the field of telephone from the very outset. Other countries, such as Great Britain, Spain or Italy allowed private telecom firms to enter the market and provide telephone services. However, these companies operated under onerous regulation and were forced to enter strict concessionary agreements with national governments – in many cases the State had the right to expropriate private firms’ assets which entailed, that private companies were reluctant to invest in the infrastructure. Countries like Germany or France established state monopolies from the very beginning.

The analysis of historical data in terms of telephone services revealed that long-distance prices were, in general, the highest in countries characterised by strict regulation where private telecom companies operated under the risk of expropriation whereas the lowest prices could be observed in countries with progressive and a more open approach to telephony in terms of private ownership and competition. Also considering rural service, the fear that rural areas would not be served in a competitive market structure appears to be misplaced as data shows that rural service was worse under state monopoly provision. Finally, it can be observed that telephone penetration was much lower in countries with a state-owned monopoly, and even worse when provided by private companies operating under stringent concessions, than in competitive regimes. However, these analyses neglect the fact that governments in Scandinavian countries did not refrain from entering the telephony market entirely as it was the State who established and maintained national telecommunication networks in the countries at issue. Hence, in order to increase the integrity and propriety of the empirical findings cited above, these facts have to be considered. Especially regulation has been looked at from a rather one-dimensional perspective and needs further detailed analysis.

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86 However, as discussed in section 3, governments in Scandinavian countries did not fully refrain from market participation as they were building and operating trunk lines; in some of them there were, indeed, state-owned telephone companies competing with private ones.
The analysis of the origins of telecommunications represents a very important research field for today’s debates on ownership, market structure and regulation in network industries although, in many cases, this particular period in history has been neglected when researching in the field of telecommunications. Despite the fact that today’s telecommunications industry and its extremely dynamic environment differ widely from those one century ago, this analysis demonstrates that there is great merit in investigating the embryonic stages and ensuing developments of the telecommunications industry, as it provides a number of valuable pointers, for instance, regarding the expanded provision of telecommunication (broadband) services to sparsely populated rural areas.

Bibliography


Internet