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ITT, LM Ericsson and their market-sharing cartel in Denmark and Norway in the 1930s

Historical cartel research has seldom considered cartels in technological advanced industries as the national telephone equipment markets in the inter-war period. These markets had few suppliers and purchasers and technological path dependencies could pave the way for stable cartels. Market sharing cartels between telephone equipment producers flourished. Most market sharing agreements were restricted to one or a few countries and involving two or more of the manufactures, or their subsidiaries, of the four main different systems of automatic switches representing competing and core technologies of a modern telephone system (Chapuis 1982). Nevertheless, these agreements should be considered international cartels. Britain was one of the first cartelized markets starting with telephone cables before 1920. After the General Post Office (GPO) decided to use the Strowger system of automatic switches a market sharing agreement between the four producers in Britain was established together with a cartel price agreement with GPO from 1923-24. This cartel was more or less in function until the late 1960s (Foreman-Peck 1985), p.224-225, (Pitt 1980) p.146-148, (Noam 1992), p.124.

This paper deals with the market sharing agreement between the telephone equipment producers International Telephone and Telegraph (ITT) and LM Ericsson (LME) regarding sales in Denmark and Norway in the 1930s considered in previous research (Attmann and Olsson 1976), p.69-70, (Jacobsen 2004), p.95-96, (Espeli 2005), p.203 ff, (Christensen 2006), p.50-54. I conclude, contrary to existing research, that despite the written agreement between ITT and LME from September 1932 they never developed a cartel in Denmark. In Norway however, a well-known and detailed market division agreement was made in July 1933. The agreement were to last until 1950 but it continued to be effective to about 1970. How can the very different outcomes in Norway and Denmark – which in many respects were very similar countries - be explained? By comparison I try, based on studies in the Wallenberg- and LME-archives, relevant Danish state archives and existing research,¹ to explain the different developments. Which differences in governance and regulation were most important?

¹ In the Wallenberg archive I have seen the papers of Marcus Wallenberg Jr., vice CEO of Stockholms Enskilda Banken who became vice-chairman of LME's board of directors after the Krueger-crash, related to LME. LME's archive, including board papers, is at Centrum för Näringslivshistoria (CN). In the Danish National Archives (Riksarkivet RA) I have studied relevant files of Telefontilsynet, the regulatory body of telephony.

I emphasize the role of the subsidiaries. Both ITT (1931) and LM Ericsson (1928) had established domestic subsidiaries in Norway producing telephone equipment and practiced cut-throat competition until the cartel agreement in 1933. Both subsidiaries were then and later relatively independent of their parent company. In 1932/33 both ITT and LME only had a small sales' subsidiary in Denmark, where domestic production of telephone equipment continued to be considered less politically important than in Norway, despite Denmark's comprehensive and protectionist exchange control regulations from 1932. Another major difference between the two countries was the role of the state telephone operator and the regulatory body of telephony, which were united in the Norwegian Telegraph Administration (NTA) while they were different actors in Denmark. NTA accepted the cartel partly based on arguments of the lacking technological interface between the two different systems of automatic exchanges and abstained from open tenders for decades after 1935. The state telephone operator in Denmark was among the weakest in Europe dominated by PTT monopolies. The independent Danish regulatory body, which worked for a unitary technological systems approach, also accepted tenders which undermined this goal as well as the potential implementation of an operational cartel agreement between ITT and LME.

The telephone equipment industry in the inter-war period consisted of four main elements, low voltage cables, transmission i.e. signalling equipment, phone sets and automatic switches, which were electromechanical devices replacing manual exchanges. The automatic switches were the core technology and the four main types of switches lacked technological interface - at least until the late 1930s – creating technological path dependencies.

An astounding example of the internationalized character of the cartelization of this industry was that the six largest manufacturers, including ITT (International Telephone & Telegraph), LM Ericsson (LME) and Siemens & Halske, negotiated two draft agreements in 1938-39 on comprehensive global market sharing for ten years on a country basis. There was one draft agreement for UK and the British Empire and one for other countries, only excluding France and its colonies, China, Japan and USSR.² The drafts documenting very

² Wallenberg archive (WA), LME's archive, box 26, file relations with ITT, undated memorandums on "proposed Telap –Agreement". This draft agreement perhaps followed in the wake of a detailed 10-year international market sharing agreement on (telephone) transmission equipment in autumn 1938 between Standard, LME, Siemens & Halske and AEG, LME's archive, board meeting 24. November 1938 § 48 with attachments.

ambitious market sharing aims never became agreements because the aims were too ambitious but also because the plans were dependent on peace between the great powers. That became unlikely after 15. March 1939 when Hitler annexed the remnants of Czechoslovakia.

The article is structured as follows: First the agreement between ITT and LME in 1932 and its background. Second follows a revised explanation of the cartel agreement in Norway in 1933 as well as its effects until the German invasion in 1940. Then follows an analysis of developments in Denmark until the early post-war period. The fourth section analyses the prolonged nature of the Norwegian cartel followed by a conclusion.

The understanding between ITT and LME

On the 12. March 1932 Ivar Krueger died triggering the Krueger-crash and the bankruptcy of Kreuger & Toll – the core company of Krueger’s fragile financial empire. Krueger had controlled a majority of LME’s shares from 1930 and had borrowed money from ITT with 34 per cent of LME’s shares as collateral. ITT had been the world largest producer of telephone equipment since 1925 when ITT purchased Western Electric, which had been divested from ATT, and renamed it International Standard Electric. LME was a much smaller producer of telephone equipment, but it had numerous subsidiaries in Europe and in Latin America and was as such a relatively large multinational.

The Krueger-crash led to very complex negotiations between the creditors of Krueger & Toll and the bankruptcy estate as well as between ITT and LM Ericsson. On 22. September 1932 an overall agreement was reached which were to secure LME’s future as an independent company. ITT and LM Ericsson made an agreement that ITT would become LME’s biggest owner controlling more than a third of the “total voting power”. The agreement were to create “the closest possible co-operation” between the “parties’ respective enterprises”. The commercial understanding were to last until 1950.

In the negotiations between LME and ITT prior to the agreement of 22 September, numerous explicit market division agreements were discussed including transfer of shares in a number of subsidiaries. Most interesting in the context of this paper is the discussions about explicit markets division on telephone equipment sales in European countries where most telephone operators were PTT monopolies or a dominating state operator as in Norway. One of the many options discussed was that ITT should sell their telephone cable producer in

Norway to LME, which would sell their production units in Austria and Hungary to ITT.³ However, ITT's powerful negotiation position made ITT disinterested in any large scale and clear-cut market division agreements.

Nevertheless, there was one exception to this. On 22. September ITT and LME added a specific agreement restricted to Norway and Denmark. It stated that neither the parent companies nor their subsidiaries should sell "automatic apparatus (...) to administrations or companies in Norway and Denmark in localities in which initial installation of automatic equipment of either of the parties has been made, and it is understood that in the tendering of initial automatic installations the two Companies will get together and endeavour to divide the furnishing of such installations".⁴ If the parties could not agree on the procedures of tenders on new automatic exchanges, ITT and LME could end up making competing tenders – in contradiction with the general agreement's principle of cooperation.⁵ The proposed cartel agreement for Norway by LME's board of directors had been much more specific to avoid such conflicts.⁶

Why was there made a separate cartel agreement regards sales of automatic telephone equipment for Norway and Denmark only? Both countries were small markets, but with a relatively high density of telephones and low degree of automation, especially in Denmark. In Denmark both ITT and LME had a small import subsidiary.⁷ In Norway ITTs and LMEs subsidiaries had competed fiercely after LME had gained control of Elektrisk Bureau (EB) an independent producer of telephone equipment, in 1928. ITT had bought a domestic cable factory in 1930 and its sales subsidiary had worked hard to increase its market share of new automatic exchanges based on Standard Electric's (SE) automatic exchanges in the capital from the early 1920s. The Norwegian telephone equipment market was in effect a duopoly in 1932 and of particular importance to LME. That was not the case in Denmark, where Siemens & Halske had been the second largest foreign supplier after SE.

³ WA, SEB, LME dossier 20, esp. papers/notes dated 9. and 10. May 1932.

⁴ WA, SEB, LME dossier 20, agreement 22 September signed by Sosthence Behn and W. Ahlstrøm, chairman of ITT and LME respectively. In addition the agreement said that the two parties should cooperate in selling telephone and telegraph equipment to the Baltic states and Russia

⁵ WA, SEB, LME dossier 20, Anteckningar rörande 19. sept. 1932.

⁶ Centrum för Näringslivshistoria (CN), LMEs archive, protokoll för Arbetsutskottet, 17.1.1933, Bilag 8 b, dir. Johanssons note 3.10.1932.

⁷ Standard Electric A/S in Copenhagen was established in 1931, (Standard Electric A/S 1941).

The detailed but flexible Norwegian cartel agreement of July 1933

Previous research has taken for granted that the detailed market sharing agreement in Norway in July 1933 was a necessary consequence of the cartel agreement between ITT and LME from 1932. The absence of a similar detailed agreement in Denmark indicates that this was not the case. New sources document that the Norwegian cartel agreement was initiated by ITT's Norwegian subsidiary. It was concerned that EB was undermining the cartel agreement between ITT and LME from 1932. SE's Norwegian subsidiary meant that lobbying by EB's workers who demanded that NTA should give increased preference to the only domestic producer of telephone equipment, was masterminded by EB's CEO – which was not the case. This could threaten Standard Electric's (SE) future position in Norway. SE's CEO for Northern Europe, Einar A. Brofos, a Norwegian and former CEO of the Norwegian subsidiary, supported the subsidiary's demands for countermeasures. NTA's CEO opposed increased preference for domestic production which could give EB and LME a monopoly. NTA, supported by its superior ministry (of Trade) advised EB to negotiate a solution with SE signalling that they would be pleased with such settlement. Thus, NTA and the Ministry of Trade, with its recently appointed minister, clearly gave a go ahead to create some kind of cartel agreement in April 1933. LME asked ITT's CEO colonel Behn to reach an agreement.⁸

Both Brofos and LME's CEO participated together with their respective subsidiaries in the negotiations on the cartel agreement 14. July 1933 lasting to 1950. The preamble of the agreement stated that it was intended to meet the “the desire” of the NTA to produce telephone equipment domestically but that that the market was insufficient for two “inland telephone factories”. This was an explicit reference to the wishes and advice of the NTA and the ministry. The Lillehammer-agreement specified in detail where the automatic systems of the two parties should be installed and that tenders should only be submitted by one party in the areas agreed to i.e. all forms of direct competition should be avoided. The market sharing agreement also represented a clear geographical division between the two automatic systems based on their present automatic exchanges. SE would keep Bergen, Aalesund, Oslo and towns around the capital while EB should have the rest of country. This was in line with the dominant views within NTA that different technological systems should not be mixed geographically to avoid the problems of lacking technological interface between the two switching systems. Formally, the contracting parties limited themselves to “recommend” its

⁸ WA, LME, box 34, file Norge diverse, esp. Kvaal to Holm 3. April 1933, Holm til Behn 11 May 1933

agreement to NTA as the telephone regulator and main telephone operator. Another clear indication that the agreement paid attention to the wishes of NTA and the Ministry of Trade, was that LME would do significant (licence) production to SE's four forthcoming exchanges, provided that SE's prices and technical requirements were met.⁹

The contracting parties were fully aware that the agreement had to be accepted by the Trust Control Board according to the Trust act of 1926 because it had a duration of more than one year and no cutoff clause. However, there are no indications that the parties notified the agreement to the Trust Control office, or that it was discussed by the Trust Control Board. That would have demanded that the agreement would have become public and this would certainly have created a political controversy in the general election in autumn 1933. Thus, according to the Trust act the agreement was illegal. This contradiction to the final clause of the agreement is surprising. Neither can it be documented that NTA received the agreement. However, NTA knew its content and acted according to its (wording and) intentions both in a tender in 1935 as well as in its switching purchases in the following decades (Christensen 2006), p.54. It is therefore highly unlikely that EB and SE did not inform NTA of the results of negotiations which NTA had supported. The most probable explanation to the secrecy of the agreement was that the actors involved took it for granted that a notification of the agreement would lead to public knowledge of a cartel, which would have been considered politically very controversial. Even more important, the Trust control board would most certainly have demanded so large changes that the cartel agreement – which included collusion of tenders which also was illegal according to the Trust act - would have been dead. The involved actors thus decided to keep the agreement secret and consequently illegal with NTA's tacit support. There is no other known example of illegal cartel agreements in Norway between 1926 and 1940. Although the Trust Act exempted export cartels, most of them also regulated the domestic market. Thus most of them were notified (Espeli 2016), p.?

Another very interesting aspect of the cartel-negotiations was that ITT's CEO Behn opened for a "Gentlemen Agreement" where EB should produce equipment to SE's deliveries in Norway until further notice.¹⁰ ITT would then not need to establish its own telephone equipment factory in Norway. However, ITT's Norwegian subsidiary decided to establish a small assembly plant on its own already in 1934. This became the basis for a switching equipment factory in 1937. The detailed reasons behind the decision in 1934 is unknown but

⁹ LME archives, board meeting 28 July 1933, Bilag 36 og 37.

¹⁰ LME archives, board meeting 28 July 1933, Bilag 37.

the subsidiary's CEO since 1931, the Swede Paul Hallberg, who had pressed for the detailed cartel agreement in 1933, became one of ITT's board members in LME from 1934. The decisions in 1934 and 1937 was not in contradiction with the wording of cartel agreement, but its intension to have only one telephone equipment factory in Norway. Hallberg was eager to defend the interests of "his" subsidiary. An obvious explanation to the establishment of SPKs telephone equipment factory was that investments in such equipment became much larger in the late 1930s than had been expected in 1933. NTA expected most of it to be produced domestically.

After the Second World War broke out in September 1939, ITT concluded that SE's large factory in Antwerp could be a war-risk as in World War I. ITT presumed that neutral Norway would represent a safe haven. Thus, ITT decided to build a large telephone equipment factory in Oslo that could supply the European market if the factory in Antwerp was destroyed or unable to supply foreign markets. EB thought the plans were a clear breach of the 1933-agreement and asked LME to act. ITT meant that the war represented a force majeure that revoked the agreement. LME prioritized its other conflicts with ITT.¹¹ However, the German occupation of Belgium and Norway in spring 1940 made SE's contingency plans redundant (Wasberg 1965), p.91-93.

With these exceptions, the cartel-agreement was adhered to by EB and SE, renamed STK (Standard Telefon og Kabelfabrikk) in 1934, as well as NAT until 1940. At least from 1935 NAT had decided that LME and SE's switching technologies should be the only ones in the Norwegian telephone system and that these systems should not be mixed geographically. In 1935 NAT rejected a very cheap offer from Siemens, arguing that it was dumping, in a tender where EB and STK submitted a common offer with 80 per cent produced domestically (Espeli 2005), p.204. There are no indications that the technological innovations making communication between different switching technologies possible, see downwards, led to any policy reconsiderations in NAT. NAT's stakeholder position also forced it to purchase more or less equally from the two domestic producers to maintain their employment from the late 1930s.

Denmark: No cartel and limited preference for SE's domestic production

¹¹ WA, SEB, LME box 34, file Elektrisk Bureau, various letters Dec.1939/Jan 1940.

In Denmark there are no indications that the general agreement on market division between ITT and LME from September 1932 were - attempted to be - implemented by their domestic subsidiaries.¹² (Jacobsen 2004), p.95-96 has argued that this was the case based LME's company history from 1976. According to the 1932-agreement the parties should negotiate and decide the division of automatic switches, with the exception of Copenhagen where SE should be the sole supplier. Neither party was interested in implementing the agreement. ITT would then probably have to give concessions to LME who had been almost absent in the Danish market. LME could be forced accept an almost complete future SE dominance. ITT's and LME's subsidiaries in Denmark were only small sale agencies with little latitude until ITT's subsidiary started to build a factory in 1935-36. The two domestic producers of telephone equipment were small and independent until they started to cooperate with either SE or LME as subcontractors in the second half of the 1930s.

Denmark also differed from Norway in other important respects. The state telephone operator was small in Denmark and had chosen SE's rotary switches in its small local networks. It had no direct regulatory power in relation to private telephone companies as in Norway. In Denmark an independent regulatory body (Statstilsynet) had been established in 1919. It worked for greater technical uniformity between the operators, mostly private regionally based companies. The government and the Ministry of Public Works had the ultimate regulatory power. Denmark was technologically unique in the sense that the largest regional company in Copenhagen (KTA) choose semiautomatic switches, which were modified rotary switches from SE, from the 1920s until the 1940s, as the only large local operator in Europe.

Although the regulatory body worked for greater technical conformity in 1930s, it had no power to overrule technological choices by the regional companies. When the regional company on Funen decided to purchase a switch from LME in 1934-35, after a tender where SE and Siemens also had participated, the government accepted this. This was LME's first major sale in Denmark, but it was a semiautomatic switch (Linstow 1950), p.60 ff. However, the open tender set an important precedent in the late 1930s. LME's win in this and a number of future tenders in Denmark was largely dependent on its ability to give buyers competitive financial credit through its close cooperation with Stockholms Enskilda Banken (SEB). SEB's vice CEO, Marcus Wallenberg, was deputy chairman of LME and its chief negotiator

¹² In the documents mentioned in note 2 it is explicitly stated that no agreements existed in Denmark.

with ITT after Kreuger's death. This aspect had not been considered in the 1932 cartel-agreement.

After Denmark had established comprehensive exchange control regulations from 1932 it became increasingly difficult to get foreign exchange to import telephone equipment from Belgium, with which Denmark's bilateral trade agreement was much delayed. SE's factory in Antwerp had been the main supplier of SE's semiautomatic exchanges in Copenhagen. The regulatory body (Statstilsynet) was concerned that balance of payment problems would lead to a postponement of a necessary modernization of the Danish telephone system with a comparative low automation rate. In 1934 Statstilsynet together with Ministry of Public Works started extensive talks with SE and the regional telephone companies to establish a domestic factory producing automatic telephone switches based on SE's rotary technology. That would also secure a unified technological basis for the future national automatic trunk call system.

SE was pleased to establish a factory in Denmark that could give it a monopoly position. However, the first agreement between SE and the regional telephone companies in April 1934 failed partly due to resistance from the Jutland telephone company which meant that SE had all too much the upper hand. The result was a new agreement in September 1934 between SE and KTA only. It gave SE a preferential status in Copenhagen. KTA bought 30 per cent of SEs' Danish subsidiary to secure its interest and control prices. The involvement of the regulatory body and the government and their pressure on KTA to sign the agreement and create the basis for SE's factory implied a political promise to give SE's technology a preference in the Danish telephone system.

However, the regulatory body was well aware of the technological advances made by the Swiss and Dutch PTTs from 1930. The Swiss PTT in cooperation with equipment producers was able to establish automatic trunk service between three different systems of automatic switches from the early 1930s, soon followed by the Netherlands. The technical success, largely based on innovations in trunk signalling, created a rapid increase in trunk calls. Switzerland made the first national plan for automatic trunk calls in 1936 followed by The Netherlands and Belgium in 1930s (Chapuis 1982), p.315-324. In 1938 Danish telephone experts from and on behalf of the regulatory body, visited the PTTs in Switzerland and the Netherlands to become acquainted with their experiences of communicating between three different switching systems. Their visit seems in the short term to have strengthen their belief

in one technological system nationally because of the extra costs and complexities linked to the extra equipment necessary.¹³ In a longer perspective, the knowledge made it easier for the regulatory body to accept different switching technologies regionally as well as nationally. In 1942 the chairman, who had been the main spokesman for choosing SE's technology, was superseded by a more pragmatic chairman.

However, Siemens' and neighbouring Nazi-Germany's demands on a share of the Danish telephone equipment market, and the mentioned Odense-tender, made it politically impossible for Danish authorities to give SE and its domestic subsidiary an absolute preference. The Jutland telephone company also wanted an open tender on its automatic switch in Aarhus. Consequently, SE, LME and Siemens were invited to a tender in early 1939. When World War II started in September 1939, the Jutland company cancelled the tender to the satisfaction of Danish authorities. However, the large demand of new telephone subscribers during the German occupation increased the need for an automatic switch in Aarhus. In 1944 the Jutland company wanted a renewed tender with the same participators. The (administrative) government accepted this in 1944 against the wishes of the regulatory body, which would wait for peace. In the beginning of 1945 LME made the by far cheapest offer which the Jutland-company wanted to accept. The regulatory body supported the protest from SE's Danish subsidiary which emphasized it had been put at a disadvantage in the tender because it could neither communicate with its parent company nor with the factory in Antwerp. Accepting LME' offer would in practice undermine the future of SE's Danish factory which the regulator had been the main mover behind. However, the internal discussions among the regulatory body's members document that principal decision to open the Danish market to other producers and technologies than SE, was taken by the government in 1938/39 regarding the switch to Aarhus. In 1944 the government had renewed its decision.¹⁴ Thus SE and its Danish subsidiary could only secure its market position if SE's switches proved to be both technically and economically competitive. The 1944/45 tender showed that neither was the case. The regulatory goal of one switching technology nationally and as well as a large domestic production by SE's subsidiary were scrapped to the advantage

¹³ Riksarkivet (RA, Danish National Archives), Trafikministeriet Telefonsynet, box 54, Studierejse til ... 2.8.1938

¹⁴ Riksarkivet (RA, Danish National Archives), Trafikministeriet 1412, Telefonsynet, box 2, Telefonsynets møter 11. January, 15. February and 31. May 1945

of (limited) competition. In these tenders LME proved to be the most competitive supplier in Denmark in the next 20 years (Jacobsen 2004), (Møller 1981), p.34 ff.

It should also be emphasized that the state since 1939 was the majority owner of the local telephone companies organized as limited companies. However the state's majority ownership of these regionally consolidated companies did not undermine their independence, including their choice of switching technology (Andersen 1986), p.28-29, (Blüdnikow 1993), pp. 139-143. These three regional telephone companies had more freedom to choose switching technology than the remaining formally independent private local companies in Norway, where NTA decided such issues as a regulator.

Denmark's generally protectionist foreign exchange regulations, administered by Valutacentralen (1932-1958), functioned to secure the two older domestic telephone equipment producers. They started to cooperate closely with either SE or LME mainly as subcontractors from the second half of the 1930s. LME also bought a significant part of the shares in Telefon-Fabric Automatic Ltd. to make it easier to satisfy the demands of a high total percentage of domestic production in the tenders including automatic switches, where the core technology had to be imported (Trustkommisionen 1960), p.266-267.

Post-war Norway: NTA continued to respect the cartel

While World War II in Denmark in various ways consolidated the principle of competition through (limited) tenders, such tenders on switches were more or less absent in Norway between 1935 and 1970. NTA, continued to respect the geographical market division of the Lillehammer-agreement of 1933. NTA's leadership experienced no substantial internal or external opposition or criticism on its switching policy although state procurements in principle should be based on tenders. Contracts of telephone equipment were divided more or less equally between ITT' and LME's subsidiaries, although ITT's subsidiary delivered the majority of the switches in the post-war period. The subsidiaries were pleased with the absence of direct competition through tenders. NTA's major challenge in the post-war period was the Labour government's meagre priority of investments in telecommunications, which it did not consider important for economic growth.

In 1945 Norway introduced comprehensive exchange control regulations like the one in Denmark from 1932 but the effects of balance of payments problems in relation to imports

of telephone equipment, including switches, proved to be different. In Norway this cemented the preferential status of the two subsidiaries and strengthened the need for NTA to treat the subsidiaries equally in terms of production of such equipment to make employment as secure possible for their workers within NTA's budget restraints. For NTA a continued respect of the cartel agreement from 1933 seemed a natural choice in its dual role as operator and regulator of the remaining private telephone companies. NTA's stakeholder responsibilities in terms of securing domestic employment and production had no Danish parallel but were watered down among the major procurers.

In Denmark balance of payments problems was not considered enough reason to deviate from choosing LME' offer, if the purchaser considered it the best solution technologically and economically, despite that fact that the core switching equipment had to be imported from Sweden. Danish authorities supported such a choice even if they knew that this could seriously undermine the future of SE's switching production in Denmark, which had been established on the initiative of the regulatory body and supported by the government. As NTA did not use tenders in procuring switches until 1967, NTA did not need to consider such choices. However, it should be noted that when NTA used open tenders to purchase radio link equipment in late 1950s, NTA did not choose the domestic producer, Nera with the state as minority owner, because it did not meet NTA's economic and technological requirements. The Ministry of Industry reacted very negatively to this decision and NTA was overruled by the government which also became the ultimate decision-maker on future NTA purchases of radiolink equipment. This was the only governmental interference in NTAs purchasing policy in the post-war period aiming to support a domestic producer of advanced telecom technology (Espeli 2005), p.411 ff. The government was uninterested in NTA's lacking use of tenders in switches, which proved to be costly for NTA and its customers, largely because domestic producers were given preference.

NTAs combined role of a regulator of private telephone companies and the dominant state operator, with ambitions of a complete telephone monopoly, was the biggest difference to Denmark. Its state operator, despite its formal monopoly on telephone calls longer than 130 km and traffic between the local/regional companies, was unable to use its strategic position to influence the technological choices by the regional companies. This was considered the role of the independent regulator. Although Telefontilsynet worked actively to secure that SE's switches should be the national standard between 1933 and 1939 it failed to convince the companies on Funen and Jutland and as regulator they had no powers to force

them. In Norway NTA had the upper hand and was never controlled, much less overruled by its superior ministry on switching issues. The private telephone companies had to adhere to the cartel agreement of 1933 if they were allowed to invest in automatic switches.

NTA's adherence to the Lillehammer cartel-agreement in the 1930s could be considered a case of regulatory capture largely due to the lack of technological interface between the two switching systems. In the post-war period however, a better way of explaining NTA's respect of the cartel agreement is its lack of independent switching competence. When procuring new switches NTA was almost totally dependent on the switching competence of its suppliers until the late 1960s. There are no indications in NTA of the switching discussions in the Danish regulatory body after 1945 where the problems of interfaces between different switching technologies was not considered an important technical or economic barrier against the future automation of trunk calls. As late as 1967, NTA choose SE's switches in Larvik, although the tender documented that they were clearly more expensive than LME's. Different technological systems would create more problems than necessary in an area with SE switches (Espeli 2005), p.405-410, 442 ff. , (Christensen 2006), p.74 ff.

NTA's passive role as purchaser of switches, in the sense that it based its decisions on the 1933-agreement, was the main explanation to the lack of any major disagreements between the cartel parties in the 1930s and in post-war years and the prolonged importance of the cartel into the 1970s. NTA's role as the only real customer after 1945 and only two switching producers also solved the problem of cheating that often breaks down cartels relatively quickly. According to NTA's understanding the prolonged endurance of the cartel from 1933 was caused by technological path dependency and lock-in because of lack of technological interfaces between SE and LME's switches. However similar technological barriers had been solved in Switzerland and the Netherlands already in the 1930s. The economic and technological problems related to communications between SE and LME's switches were not considered an essential element in Danish tenders on switches from 1945 either. In the 1960s also Siemens won important switching contracts in Denmark (Møller 1981), p. 40. It is surprising that the solutions linked to the problems of technological interface between different switching systems seemed unknown to or were interpreted very differently by NTA's switching engineers than by Danish switching experts. The best explanation seems to be that the NTA's switching competence was small and not technologically updated. ITT's and LME's Norwegian subsidiaries could easily exploit this.

Conclusions

Market sharing cartels between telephone equipment producers flourished in the inter-war period. The main parties in these cartels were multinational companies although the detailed agreements were often limited to one or a few countries or mainly involved their national subsidiaries as in Norway. These cartels are rarely mentioned in the cartel literature, much less considered in the historically based cartel theories, although they should be interesting because they were both national and international cartels. International cartel research has seldom studied technologically advanced industries in the inter-war period or the role of cartels in markets dominated by a state monopoly (PTT) or relatively few core customers in each country nor the role of regulatory bodies in telecommunications and other infrastructure industries (Grossman 2004).

The cartel agreement of September 1932 between ITT and LME on installations of new automatic switches Denmark and Norway was the only market sharing cartel resulting from the complex negotiations between ITT and LME making ITT LME's largest shareholder, after the Krueger-crash. The main aim of the negotiations from the Swedish side was to secure LME's future as an independent company despite accepting ITT as its biggest owner. It was based on a commercial understanding lasting to 1950 that the parties would not work against each other but cooperate as close as possible. As ITT was by far the most powerful of the two, ITT was not interested in clearly regulating the many conflicts of interest in Latin-America and Europe except for Denmark and Norway. In both countries ITT's subsidiary, SE, was the largest in (semi-)automatic switches and wanted to secure its market position while Norway was an important market for LME to defend. The inclusion of Denmark could be considered a concession by ITT because LME was hardly present there in 1932. The cartel agreement between ITT and LME was a small detail in their overall understanding and no actions were made to implement it in practical terms until SE's Norwegian subsidiary suspected that LME's manufacturing subsidiary was undermining SE's market position based on its domestic production.

International cartel agreements were often implemented by subsidiaries through nationally based cartels. Subsidiaries were organized in different ways often depending on national conditions and having different forms of operational independence. The case of Denmark documents that although a cartel agreement existed between ITT and LME none of them, or their subsidiaries, were interested in implementing it. For SE's Danish sales'

subsidiary, a cartel could weaken its market position while LME could risk being excluded from competing in Denmark indefinitely. In a counterfactual analysis one could argue that a cartel would have been broken down by the strong culture of tenders – at least in this sector - in Denmark. The principle of tenders was also the normal rule in state procurement in Norway but NTA could easily circumvent it without sanctions as the procurement policy of automatic switches from 1935 shows.

Sectorial-based regulatory bodies often play an important role in formulating and implementing competition policy or the absence of competition than the bodies established to control and regulate competition generally. This was the case in Denmark, which did not have a completion law as Norway until 1937/38, and in Norway but with very different results in terms of cartelization and competition. The Norwegian case documents the irrelevance of competition policy and the Trust law of 1926. It was based on the principle of notification of restrictions on competition and intervention against abuse of market power. The trust control office' small resources made it dependent on notification or other forms of information to investigate secret cartels or possible abuse of market power. NTA as a large and influential governmental body, which combined the role of regulator and the role of dominant customer and operator, accepted and legitimized the illegal cartel agreement and thus actively undermined competition law in this sector. This was not a unique example in Norway, where the sector regulation body for insurance worked actively to establish and main the comprehensive life insurance cartel for decades (Espeli 2019).

The regulator of telephony was an independent body in Denmark while NTA was not differentiating its role as regulator from its role as the dominant operator wanting to achieve a complete monopoly as soon as possible. Their regulation policies differed fundamentally over time. In the 1930s the Danish Telefontilsynet, supported tacitly by the government, worked for a national telephone system based on SE's switching technology, i.a. technologically based monopoly. However demands from Siemens and Nazi-Germany to compete on the Danish market together with the Jutland telephone company's wish to get the best offer through competition, destroyed this regulatory goal in 1938/39 - and under different circumstances in 1944/45 - replacing it by competition through tenders with lasting effect.

Balance of payment problems played an important role in the development towards bilateral trade agreement and increased protectionism in the 1930. Denmark's comprehensive currency regulations from 1932 had no Norwegian equivalent until 1945. In Denmark the

preference for domestic production started a development towards a producer monopoly for advanced telephone equipment by SE's subsidiary in Denmark but this development was checked by Nazi Germany in 1939. In Norway protectionism contributed to a stable duopoly cartel based on two domestic producers. World War II consolidated the Norwegian cartel while the war created the path for competition via tenders and foreign participators in Denmark.

The long duration of the Norwegian cartel was due to two main factors which were closely linked. First, the two contracting parties were generally loyal to the agreement and cheating was much easier to document than in other cartels. Second, NTA, combining regulatory authority and the role of the dominant operator, accepted and supported the market division cartel, although it is unclear how NTA was informed about the cartel agreement. NTA never opted for open tenders between 1920s and the 1980s because it feared that the different technological interfaces between different equipment producers in the same geographical areas would create significant and costly difficulties in developing an efficient national telephone system. In Denmark similar arguments of lacking interface between different switching technologies were widespread within the regulatory authority, in the 1930s and the beginning of the 1940s. However, when the regulating body in Denmark tried to implement such arguments in May 1945 it was overruled by the government which meant that a clear winner of an open tender should get the contract regardless of possible technological lock-ins. The Danish regulator then abandoned the idea that different switching systems could not communicate with acceptable costs and technical challenges. Until the 1970s however, NTA continued to believe that the costs and technical difficulties linked with establishing future trunk automation between different switching systems, in effect functioned as a defence for a continuation of the market division cartel.

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