

Edvin Johnsrud

The Process of Moulding Transparent Containers

Consolidation and Cartelisation in the Norwegian Glass Bottle Industry, 1906-1928

Master's thesis in History with Teacher Education

Supervisor: Espen Storli

May 2022



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Abstract

This thesis examines the Norwegian glass bottle industry, and its entry into the European glass bottle cartel in the early 1900s. Membership provided access to critical innovation, mandated the firms to align with quotas and price fixing, and subsequently led to consolidation in the domestic glass bottle industry. The location of Michael Owens' glass bottle machine had a large impact on the futures of several Norwegian glassworks, Moss and Larvik being two of those.

How external events affected the dynamic between the Norwegian firms and the cartel is also explored by looking at operations during the First World War. The source material examined in this thesis consists mainly of telegrams sent from the cartel office in Düsseldorf to Moss Glassverk, with some letters received from other parties and circulars from Moss to their investors as well. The material, found in several archives, is examined together with relevant literature. This is to understand how the Norwegian firms were able to join the cartel, why they were allowed to do so, and how their membership affected their position in the domestic industry.

Samandrag

Denne masteravhandlinga omhandlar den norske glasflaskeindustrien og byrjinga på samarbeidet med det europeiske glasflaskekartellet. Medlemskapet gav tilgang til teknologi som var kritisk for innovasjon, samstundes som det gjorde at selskapa måtte innrette seg etter faste kvoter og bestemningar kva gjeld pris. Dette førte til samling i den nasjonale glasflaskeindustrien. Kor Michael Owens glasflaskemaskin vart installert avgjorde framtida til flere norske glasverk, mellom anna Moss og Larvik.

I avhandlinga vert det også utforska korleis eksterne hendingar påverka dynamikken mellom dei norske selskapa og kartellet, med fyrste verdskrig som utgangspunkt.. Avhandlingas kjeldemateriale består i hovudsak av telegram frå det tyske kartellkontoret i Düsseldorf, med nokre telegram frå andre selskap og brev frå Moss til deira kunder og investorar. Materialet kommer frå fleire ulike arkiv - alle tilknytt Moss Glassverk, og vert undersøkt i samband med relevant faglitteratur. Dette i freistnad på å finne ut korleis dei norske selskapa vart med i kartellet, kvifor dei vart inkludert, og ikke minst kva for effekt medlemskapet deira hadde på den norske industrien.

Preface

I arrived in the autumn of 2017 with a moderate interest in history, wanting to become a teacher. Now, five years later, I leave with a moderate interest in teaching, wanting to become a historian. The last five years have been formative to say the least, and have offered me the chance to meet many great people, and obtain a lot of fascinating, sometimes even useful, knowledge. Whether I become a teacher or decide to do something entirely different, I will always be grateful for the opportunities given to explore and discover both myself and my surroundings while at NTNU.

Returning to the topic of glass bottles, I owe a lot of gratitude to many, some of which I propose a figurative toast to here (and perhaps a literal one later). First and foremost, this thesis would never have happened had it not been for my supervisor Espen Storli. Not only did you provide me with the topic of glass bottles that fateful day more than a year ago, but also with a lot of excellent and formative feedback since then. You taught me that academic and creative writing are not always mutually exclusive, and I believe the thesis has benefited enormously from that.

I would like to thank Mona and Camilla at Østfoldmuseene, who both assisted me in my search for primary source material during my “Østfoldsafari” in the summer of 2021. I am also grateful for everyone who has read and provided feedback on my writing along the way, especially those that endured the thesis in its entirety during the final days of this project.

Finally, I appreciate everyone at NTNU Dragvoll who has made sure my workspace was clean and pleasant looking, fed me on

indefensively pricey baguettes and kept me guessing on whether my keycard would validate every morning. Your encouraging smiles and good spirits have made my final semester more than bearable.

Edvin Johnsrud

Trondheim, May 2022

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Chapter 1: Releasing the Cap - Introduction and Research Design

What do glass bottles, cocaine and linoleum have in common? While true that one might stumble upon them given a certain level of inebriation, a lesser known similarity is that cartels were established around all three commodities in the early- to mid-1900s in Europe. Today, cartelisation is often associated with illegal substances, but looking into the history of international trade, one will soon discover cartels coordinated around a vast array of tradable goods and raw materials.¹

Cartels could operate as one actor within a sector, but functioned often as loosely connected organisations with individual companies willing to cooperate as long as it benefited them. Several cartels within the same sector were also possible, which the aforementioned linoleum industry was an example of.² Cartels were considered beneficial to the economy at the time.³ The topic of cartelisation is therefore varied both in terms of structure, meaning the agreements within the cartel, how the cartel was situated in its sector, and also in terms of the goods or services cartelised. This makes cartels a topic that can be approached from a number of different ways. Thus, they allow the historian to convey many different stories. That is also the case for the historian that has written the

¹ Hexner, E. (1946) *International Cartels*. Greenwood Press, p. 308, 370-1. The International Cocaine Convention was established in 1930 with its headquarters in Germany. The linoleum cartel was established in 1910 under English and German leadership, with members from all over Europe. Hexner lists these together with an impressive number of other cartels.

² Hexner 1946, p. 370-1

³ Schröter, H.G. (1996). Cartelization and decartelization in Europe, 1870–1995: rise and decline of an economic institution, *Journal of European Economic History*, 25(1), 129–153. p. 129.

following thesis, where the cartel is a vehicle to examine emerging technologies, war and, of course, Norwegian glass bottles.

Parts of the Norwegian bottle industry entered into a collaborative partnership with other European bottle manufacturers in 1907.⁴ This led to a lengthy relationship with rapid innovation in an otherwise archaic industry. The process of making bottles had seen little change between its invention in the first century and the end of the 1800s, however, significant developments took place between 1860 and 1920. These brought large changes for the individual firm, their employees, and the industry as a whole.⁵ The Owens machine, developed by the American Michael Owens (1859-1923) during the transition from the nineteenth to the twentieth century made the manufacturing fully automatic.⁶ Blowing bottles had up until that point in time been done manually by specifically trained glassblowers, who could now be replaced by factory workers in large automatic glassblowing huts. This affected not only the manufacturing process itself, but also how the industry was structured.

The following thesis examines how the Norwegian glassworks in Moss and Larvik adapted to the changing market conditions, and how the introduction of new technology impacted both domestic as well as international relations within the sector. Specifically, two research questions are investigated:

⁴ Biram, R. S. (1958) The Introduction of the Owens Machine into Europe. *Journal of the Society of Glass Technology* 42:19N-45N, p. 24N. The terms *manufacturer* and *firm* are used interchangeably throughout the thesis.

⁵ Cable, M. (1999). Mechanization of Glass Manufacture. In *Journal of the American Ceramics Society* 82(5), 1093-1112. Turner, W. E. S. (1938) The Early Development of Bottle Making Machines in Europe. *Journal of the Society for Glass Technology* 22(92):250-258. Cable claims that the innovative period began at the end of the 19th century (p. 1093), while Turner details developments from 1860. (p. 251-253)

⁶ Hammer, S.C. (1931) Den norske flaskeindustri. Aktieselskapet Moss Glasværk, p. 83. Turner 1938, p. 257. Biram 1958, p. 19N-20N.

- 1) How did technological developments promote cartelisation and consolidation in the Norwegian glass bottle industry?
- 2) How did international cartels affect developments in the Norwegian industry?

Hypotheses

The research questions above encourage several hypotheses. First, that the Norwegians became involved with the *Europäischer Verband der Flaschenfabriken G.m.b.H* (referred to as either *E.V.* or simply *the cartel* moving on) due to the technological advantage that such a partnership would provide. The Norwegian manufacturers played a small part in the spectacle that was the industrialisation of Europe, and market leading partners were therefore vital to participation in the modernisation process that took place within the industry.

I would also hypothesise that being restricted on exports, which was typical for international cartels at the time, was of little consequence for the Norwegians, as their production was of a relatively small scale compared to other members of the cartel. Protecting the domestic market from large international competitors however, would have been a significant advantage of cartelisation.

Having debated the intentions of the Norwegians, exploring the intentions of the cartel itself becomes important. Here, I hypothesise that the cartel accepted the Norwegians as members due to high import duties. As mentioned, the domestic industry in Norway was small compared to other European countries, and raising import duties would be an effective measure the government could take to protect the sector from foreign competition.

Historiography

To aid in examining the specified hypotheses, the historiography has three main components; the Norwegian sector, the glass bottle industry, and cartel literature. The Norwegian glass bottle industry is sparsely covered, while there exists more material on the glass bottle industry itself. Cartels are covered in both the field of economic theory and economic history, and while relatively neglected compared to other parts of these fields, the amount of literature still vastly outnumbers the two other components. Due to the nature of the E.V., which is covered extensively in chapter 3, the cartel literature has been focused on the relationship between patents and cartels. The three parts are interlinked, and do therefore overlap somewhat. However, as this is often incidental, with very little literature purposely covering the E.V. as an example, the components are dealt with mostly separately here.

The Norwegian Sector and Cartel Involvement

The Norwegian Glass Bottle industry has been detailed by Simon Christian Hammer in *Den norske flaskeindustri* (1931). The book covers the industry from its inception in 1741 until the publishing in 1931.⁷ Hammer's book does therefore involve both Larvik and Moss Glassverk, from their beginnings in the early 1870s and 1897, respectively.⁸ The book is based on several different types of sources, both documents as well as interviews with key actors in the story, who were still alive at the time of writing. Hammer describes how the Danish government wanted

⁷ Ødegaard, A., Lier, O. & Grønli, J. (1998) PLM Moss Glassverk AS 1898-1998. AS Moss Glassverk, p. 3. Hammer 1931, p. 5.

⁸ Hammer 1931, p. 37 & 58-9.

to establish a domestic industry, and how the introduction of new technology impacted the different Norwegian glassworks.⁹ Developments during the late 19th and early 20th century are especially elaborated upon, with the introduction of the Owens machine and subsequent consolidation being examples.

Finn Saupstad jr. wrote *PLM Moss Glassverk AS 1898-1973* in 1973 to commemorate the 75th anniversary of the company. The book is heavily based on Hammer's work, with interviews and source material from after 1931 used to cover the remaining period.¹⁰ Saupstad jr.'s book was appended in 1998 by Arne Ødegaard, Ole-Jørgen Lier and Jan Grønli with the title *PLM Moss Glassverk AS 1898-1998* as part of the glasswork's 100th anniversary.¹¹ While Hammer covered the glass bottle industry in Norway in general, the last two books focus on Moss Glassverk exclusively. The existing material is therefore missing two important angles; the Norwegian glass bottle industry outside of Moss after 1931, and coverage of the industry in the late 19th and early 20th century based on a wider source material with assistance from hindsight. The latter will be covered in this thesis.

Norwegian cartel membership was covered by Espen Storli in his doctoral thesis on the Norwegian aluminium industry, *Out of Norway Falls Aluminium - The Norwegian Aluminium Industry in the International Economy, 1908-1940* (2010). The thesis looks closer at the international nature of the Norwegian aluminium industry, with an emphasis on "the interplay between Norwegian smelters and the greater

⁹ Hammer 1931, p. 3.

¹⁰ Ødegaard et al. 1998, p. 3.

¹¹ The company Moss Glassverk was established in late 1897, but the glasswork did not begin production until the spring of 1898, hence the discrepancy between the establishment date and the title of Ødegaard et al.

international aluminium industry”.¹² Helge Nordvik has explored the impact of international cartels in the Norwegian tobacco industry in his chapters in *Blader av tobakkens historie* (1978). As in Storli’s thesis, the international cartel established local production in Norway. Contrary to Storli however, there was already a domestic tobacco industry when the cartel arrived at the scene. The existing industry left the cartel alone at first, due to limited impact in the market, but changed strategy after the cartel became a competitor.¹³ The glass bottle firms covered in this thesis differentiates from the Norwegian actors mentioned in Storli and Nordvik. From Storli, as the manufacturers were not established by the cartel, but had been in business for some time before joining, and from Nordvik as the already established industry cooperated closely with the international actors.¹⁴ The combination of domestic actors joining an international cartel to supply the domestic market makes the thesis stand out from both.¹⁵

The Glass Bottle Industry

There are large amounts of literature written on glassblowing as well as glass containers. Michael Cable reviews the mechanisation of glass manufacture. The article summarises the technological development from

¹² Storli, E. (2010) *Out of Norway Falls Aluminium - The Norwegian Aluminium Industry in the International Economy, 1908-1940* [Doctoral thesis]. Norwegian University of Science and Technology, p. 21.

¹³ Nordvik, H. (1978) *Perioden 1915-1940. Produksjonsutviklingen i tobakksindustrien*. In Sejerstad, F & Svendsen, A. S. (ed.) *Blader av tobakkens historie - J. L. Tiedemanns tobaksfabrik*. (p. 251-290). Gyldendal Norsk Forlag A/S, p. 255-61.

¹⁴ Storli 2010, p. 315.

¹⁵ Nordvik 1978, p. 259. Storli defines all of the Norwegian aluminium manufacturers as resource-seeking FDI (foreign direct investment), meaning that the investment is aimed at an immobile resource, which was cheap hydropower. The different plants played different roles for their international owners, but all exported aluminium outside of Norway (chapter 9).

an industry that had remained relatively static since its inception in the first century, which then went on to change radically over the span of a few decades from the end of the 19th to the early 20th century.¹⁶ William Ernest Stephen Turner in his article *The Early Development of Bottle Making Machines in Europe* looks at this transition as well. Contrary to Cable, Turner's article is contemporary, and delves into much more detail, especially in terms of patents, which is crucial when the E.V. is to be examined later on.

Carroll Daugherty's *The Settlement of Industrial Disputes in the Glass Bottle Industry* examines a different angle to the technological advancement in the glass bottle industry, being that of how mechanisation affected the glassworkers.¹⁷ While the relationship between employers and their employees are described by Daugherty as peaceful, his article reveals a lot of information related to how disputes were to be resolved if they occurred.¹⁸ This dynamic was significant to the material developments in the industry at the time. George Miller and Catherine Sullivan's *Machine-Made Glass Containers and the End of Production for Mouth-Blown Bottles* overlaps both Cable and Daugherty, examining the relationship between new technology and the glassworkers closer. The authors look closer at the difference in production efficiency with the introduction of new technology, remarking on the massive gains that can be achieved.¹⁹ David Dungworth's *Three and a Half Centuries of Bottle Manufacture* examines the bottle glass industry in England. The article

¹⁶ Cable 1999, p. 1093

¹⁷ Daugherty, C. R. (1928). *The Settlement of Industrial Disputes in the Glass Bottle Industry*. *Journal of Political Economy* 36(6), p. 699-719.

¹⁸ Daugherty 1928, p. 699.

¹⁹ Miller, G. L. & Sullivan, C. (1984) *Machine-Made Glass Containers and the End of Production for Mouth-Blown Bottles*. *Historical Archaeology*. 18(2) 83-96, p. 86.

details the modernisation that took place in the industry in the period this thesis is concerned with, and overlaps with all the researchers mentioned above. Interestingly, Dungworth presents a different take on the economic benefits of modernisation. While machine-made bottles were cheaper to produce, Dungworth points out the trade-off of increased efficiency, that being a more limited range of glass and higher material cost.²⁰ Here, Dungworth contextualises the gains remarked by Miller & Sullivan. Regardless of the cost of efficiency, it is clear that a significantly larger volume of glass bottles could be produced post-mechanisation, which in turn brought the issue of overproduction to the industry.

Cartels

R. S. Biram's article *The introduction of the Owens machine into Europe* (1958) bridges the gap between cartel literature and the glass bottle industry. Not only does Biram detail how the Owens machine came to Europe, but also how the cartel was established around the accompanying patent. The article elaborates on the agreements signed by the cartel and its members, as well as the agreements made with the Owens Company.²¹ In addition to the establishment of the E.V., Biram covers how the First World War affected operations within the cartel.²² This is of particular importance to the thesis, as the Norwegian manufacturers had to suffer the consequences of being neutral while trading with both sides..

Weimin Wu examines patent pools in *Managing Cartels Through*

²⁰ Dungworth, D. (2012). Three and a Half Centuries of Bottle Manufacture. *Industrial Archaeology Review* 34(1), 37-50, p. 48.

²¹ Biram 1958, p. 21N - 29N.

²² Biram 1958, p. 34N - 40N. This aspect of the cartel is covered more extensively in chapter 3 and 4 of this thesis.

Patent Pools (2019). The close relationship between the E.V. and the Owens Company to begin with, later with Hartford Empire (referred to as either *Hartford Empire* or simply *Hartford* moving forward), makes this an important angle. Hartford Empire makes an appearance in Wu's article, and the patent pool controlled over 600 patents in the glassblowing industry from 1935 until it was dissolved by the U.S. Supreme Court in 1945.²³ This consolidation shared similarities with the one that took place amongst glass bottle manufacturers, and the two giants Hartford and the E.V. crossed paths on several occasions. The glass bottle cartel had many patents, and its management style is therefore similar to patent pools.

Iwan Bos and Marco A. Marini discuss cartel stability in their article *Cartel stability under quality differentiation* (2019). Quality differentiation is when cartel members are designated market shares based on price and customer base. As an example, one firm sells a product of high quality and high price to a customer base that prioritises quality over price. A different firm in the same cartel targets a customer base that values price over quality, and is therefore selling a cheaper product of lower quality. The cartel captures a larger part of a differentiated market with this strategy.²⁴ The angle of quality

²³ Wu, W. (2019) Managing Cartels Through Patent Pools. *The Antitrust Bulletin* 64(3) 457-473, Hartford Empire was formed through a merger between the research company Hartford Fairmont and the Empire Machine Company in the early 1910s. They owned a few patents after the merger, one of which being the gob-feeder, which became important to the E.V. later. The company then went on to acquire patents from many different actors in the glass container industry, which it was able to do by exploiting uncertain manufacturers in a rapidly changing market. Wu compares Hartford to Standard Oil in terms of impact in its industry. Hartford went on to police other entities within the industry, cartels being amongst those. (p. 469-471.)

²⁴ Bos, I. & Marini, M.A. (2019) Cartel stability under quality differentiation. *Economics Letters* 17(4), p. 70-3.

differentiation is interesting in regards to the bottle industry, as it is conceivable that certain types of bottles could be produced for many of the members of the cartel by a single member, such as particularly high quality bottles that were sold in limited amounts. Quality differentiation could therefore conceivably be a part of the E.V. structure, which will be further examined in chapter 5.

Both Wu and Bos & Marini cover aspects of cartel stability - Wu with patent pools, and the latter with quality differentiation. Levenstein and Suslow's *What Determines Cartel Success?* (2006) provides more general, but still useful context on cartel establishment and stability. Their article details the concepts of quotas and price fixing amongst others, two factors very relevant to the establishment of the E.V. around the Owens patent.²⁵ Some of the other concepts covered, such as cheating, are relevant even if no evidence supports this taking place in the E.V., as it demonstrates what the different measures taken by the cartel were prompted by. Finally, Levenstein and Suslow explain some of the challenges with investigating cartels as a historian, like that of determining cartel duration. This is very much a factor for the E.V., who despite shedding many of its restrictive features after the Second World War, still continued to exist.²⁶

²⁵ Levenstein, M.C. & Suslow, V.Y. (2006) What Determines Cartel Success? *Journal of Economic Literature* 44, p. 43-95. The topic of price wars discussed on pages 47-8 is particularly relevant.

²⁶ Biram 1958, p. 45N.

Sources and Methodology

Delimitations

Emphasis has been placed on the modernisation in Europe that took place in the period of cartelisation instead of the technological progress during the 19th century. Excluding this leadup to the first bottle machines enables a focus on purely the glass bottle industry's reaction and subsequent implementation, which is the core of the research question. The largest innovations had already taken place at the end of the 1920s, making the succeeding period less relevant. In addition, the primary source material is also less complete from the end of the 1920s, meaning that assumptions made regarding this period of time are either based completely on secondary material, or on assumptions drawn from the existing primary sources.

The research questions limit the discussion to Europe, and Norway in particular, but America will be briefly mentioned when necessary, as the Owens machine was invented there. The Norwegian cartel delegate consisted of Moss and Larvik Glassverk (which will be referred to as Moss and Larvik in the thesis), and the discussion will concern itself with these actors primarily.²⁷ This is not to say that others did not exist, but not having access to the Owens patent makes other firms less relevant.

²⁷ The structure within the Norwegian delegates are explained in chapter 2. Bergen Glassverk was technically also in the cartel with Moss and Larvik, but due to factors revealed in the section on the Norwegian glass bottle industry, the glasswork has been omitted. Larvik Glassverk is sometimes called *Laurvig Glassverk* in the source material, but will only be referred to as *Larvik* in this thesis.

Primary Source Material

The primary sources used in this thesis originate from two archives belonging to the *Østfoldmuseene* foundation, one located in Sarpsborg, the other in Moss. The foundation has nine departments in total, and is a collaborative partnership between several smaller organisations and public organs. Some of the fields *Østfoldmuseene* researches are natural-resource history and industrial history in the region.²⁸ The material from both of these archives is related to Moss Glassverk, and was the reason these particular archives were chosen over others belonging to the same foundation.

Official documents from the Norwegian parliament have been used when researching import duties. Material related to the Norwegian Trust Control has been examined as well, but due to the late establishment of this institution, the material related to the domestic glass bottle industry falls outside of the scope in time. This can also be said for the source material from Larvik Glassverk in *Vestfoldarkivet*, which covers protocols from the general assembly between 1888 and 1901.

The material examined at *Borgarsyssel Museum* in Sarpsborg consists mostly of telegrams sent to Moss from the cartel and other partners, as well as copies of telegrams sent to the cartel from Larvik. These telegrams give insight into the direct communication between the Norwegian actors and the cartel. Half of the conversation, the correspondence from Norway to Germany, is often missing, but their contents can be obtained by reading replies, which sum up earlier telegrams. These are in German, and while some of them were translated

²⁸ *Østfoldmuseene* (2022). Om *Østfoldmuseene*. *Østfoldmuseene*. Retrieved May 5, 2022 from: <https://ostfoldmuseene.no/om>.

by the recipients at the time, most were not. The remaining telegrams have therefore been translated in the process of writing this thesis. The other documents examined in Sarpsborg contain information regarding how the relationship between Moss and the cartel affected other relations. These documents contain letters from Moss to its customers and owners, as well as letters and telegrams sent to Moss from other institutions, like patent offices and business companions.

The other department, located at *Moss industrimuseum* contained mainly circular letters sent from Moss. These delve into administrative decisions made on the back of the changing conditions in Europe, as well as changes in the agreement with the cartel. The circular letters are therefore a good supplement to the telegrams from Sarpsborg, as they highlight how the day-to-day operation at Moss was affected by the cartel.

The incomplete coverage of the material creates certain challenges. Even though most telegrams reference the previous message in the conversation, it is hard to say whether all the information is referenced or not. Uncovering possible misunderstandings between the different parties is also much harder being in possession of just half the conversation. The gaps in the timeline were mostly straightforward to fill, but not always. There is no guarantee that material that could potentially change the context of the events proceeding has been lost.

The archives lack information that could be, and should be considered important to this thesis, such as the formation of the cartel and the implementation of the Owens machine. These aspects are covered by the secondary literature instead.

Sources and Accuracy

Certain criticism can be levied at parts of the source material that forms the basis of this thesis, and should be acknowledged. Many of the sources on the glass bottle industry originate within the industry itself, which can lead to conflicts of interest as an example. While Hammer himself had no formal affiliation with the industry, the way he portrays some of the personalities in his book, the shareholder in both Moss and Larvik Glassverk Johan Jørgensen being an example, makes him look somewhat biased.²⁹ The fact that Hammer bases much of his book on interviews is noteworthy, as these are missing as of 2022. There is therefore no way of accessing the interviews for contemporary historians, who can only read Hammer's interpretation. R. S. Biram, the author of the article which references the E.V. agreement later in the thesis, was closely connected to the European glass bottle industry himself.³⁰

The correspondence between the Norwegian manufacturers and the European actors within the cartel may not reveal the entire truth regarding the partnership. The telegrams are very formal and polite,

²⁹ Hammer 1931, p. 80 is one of many examples. Hammer depicts Jørgensen as a man that had "never forgotten his motherland", and was subsequently interested in saving its glass container industry (p. 80-1). Whether or not this is the entire truth can be questioned however, as Jørgensen had with the help of his London-based company bought shares in several Swedish firms as well, which is indicated by the fact that the Norwegian and Swedish firms joined the cartel together with one shared representative (Biram, 1958, p. 28N). Having shares in all of these companies which were members of the cartel would surely benefit Jørgensen financially in addition to being a display of his patriotism. Jørgensen was at the time a respected man in Norway, supported by the fact that he was awarded St. *Olavsmedaljen* in 1939 for his work promoting Norway and Norwegians in London (a more detailed comment on the award was requested, but the archive is unfortunately confidential) (Det Norske Kongehus (1939) Tildelinger av ordener og medaljer. Det Norske Kongehus. Retrieved May 3, 2022 from: <https://www.kongehuset.no/tildelinger.html?tid=28028&sek=&q=J%C3%B8rgensen%2C+J.&type=27123&aarstall=1939>). His status in Norway may have affected how he was depicted by Hammer.

³⁰ Biram 1958, p. 19N.

which makes it hard to express potential negative sentiments towards the cooperation, if they existed. That being said, no major discrepancies within the source material examined has been detected, neither for primary or secondary. In fact, the different materials often corroborate on their depictions, even those that are not referencing each other.

Relevance for the Teaching Occupation

Fundamental to the thesis is the aspect of corporate influence in the world, both at an individual level and a government one. The level of influence has arguably fluctuated during the 20th century, but corporate interests are still present today. Even if that was not the case, economic cartels function as context for other contemporary historical events. The rise of big technology in the 21st century warrants discussion of private actors in the classroom, and will be a topic that most students can relate to.

History as a subject has, for the better I would say, stopped concerning itself with merely names and dates. The matter of how history affects our surroundings has taken centre stage, meaning that history should be taught with the objective of contextualising the contemporary world. Cartels are linked with many relevant topics for the classroom, like the introduction of new technology, international relations as well as large changes in our surroundings.³¹ The knowledge gained from writing this thesis is therefore making me able to convey both current and historic events more thoroughly.

³¹ The consequences of technological innovation is part of the competence aims in the current history curriculum in upper secondary as well as social studies in lower secondary school. The social studies curriculum does also have an aim related to international cooperation (Utdanningsdirektoratet 2020a, Utdanningsdirektoratet 2020b).

Thesis Structure

This thesis consists of five chapters, this being the end of the first. The following two chapters delve into the historical background of the glass bottle industry in Norway and Europe, followed by cartel theory related to patent pools, quality differentiation, management and stability. The main aim of these chapters is to place the thesis within both a historical and theoretical context, before moving on to the next two chapters.

The fourth chapter is spent examining the source material, both primary sources from the aforementioned archives as well as secondary literature. The aim of this chapter is to analyse the material chronologically and assemble a timeline, to aid the examination of the research questions and hypotheses. The chapter will investigate the Norwegian entry into the cartel, specifically why the delegation entered, why it was allowed entry, and how it affected the domestic industry. Then, the operation of the Norwegian glassworks during the First World War enters the spotlight, which with help from the secondary literature and telegrams from the archives will look closer at how the cartel managed to continue operations and what this meant for the Norwegian firms. Following that, correspondence between the Norwegian firms and the German office of the E.V. is reviewed in order to determine operations during peacetime. Licence fees and repairs will be a focus. Finally, Moss purchased new machines made by a different manufacturer in 1927. The source material is investigated to explain why this happened, and how it could occur while still being part of the cartel.

The fifth chapter builds upon the fourth by using its findings to answer the research questions and evaluate the hypotheses proposed in

the first chapter. The chapter includes an analysis of how the entry into the E.V. led to consolidation in the Norwegian industry, as well as how the cartelisation was a result of consolidation that had already occurred in Europe. Then, management through quality differentiation and patent pools is contextualised by the findings from chapter 4 to determine to what extent these management styles applied to the E.V. Import protection and export restrictions and the cartel's relationship with both is examined before suggestions for further research are proposed and conclusions are drawn.

Chapter 2: Getting to Know the Bottle Industry

Attempting to grasp glass bottle cartels without being versed in the glass bottle industry is like choosing wine for an unknown menu. While not entirely hopeless, context is certainly king. This section will therefore give background on a few crucial parts of the glass bottle industry before delving into cooperation in the sector.

As is typical when discussing industry, one has to begin with Britain. The British industry is a good example of how industrialisation rapidly changed the method of producing glass bottles. Glass bottles had been produced in Britain since at least the early 17th century, with several examples of the ‘English’ bottle discovered in what Dungworth refers to as *excavations* at several former glasshouses.³² Evidence suggests that the first glass bottles were ‘free blown’, which changed with the introduction of moulds during the early eighteenth century.³³ Samples of bottles from the 18th century are generally made from stronger glass than those from the early 17th, indicating a development in material use.³⁴

While change had occurred before industrialisation, the transition from man to machine made, both semi- and fully automatic, was an enormous change in comparison. This process further increased consistency, in fact to such a degree that one could identify the respective bottle machine by looking at its bottles in some cases.³⁵ To begin with, a very brief summary of the history of glass manufacturing is given, before

³² Dungworth 2012, p. 38. The term *excavation* makes the process sound somewhat more archeological than the time period suggests, however, I decided to stick with the formulation from the source material.

³³ Dungworth 2012, p. 38 - 39

³⁴ Dungworth 2012, p. 42 - 43

³⁵ An example of this is the “Owens suction scar”, which could be found on the bottom of every bottle made by the Owens machine. (Miller and Sullivan 1984, p. 95)

aspects of the industry within the time period are dealt with. These are applications of containers and developments of demand, unions and technological developments within the field of glass container manufacturing. After that, the chapter shifts focus to Norway, where the stage is set for developments and consolidation.

On the Application of Glass Containers

Generally, the profession of blowing glass into bottles or other products, required a certain amount of specialisation pre-industrialisation.³⁶ Glass containers had little impact in markets, due to low demand, which in itself was partly caused by high production cost and therefore relatively low supply.³⁷ Smaller containers were also less important in a decentralised world where one's own production was a large part of consumption. A farmer was less likely to bottle large quantities of milk for himself compared to a store owner selling milk to their customers. The latter had to consider all the complicated details that follow operating within a market. Selling milk to consumers in large containers is impractical, as it would expire. Smaller containers, like the glass bottle, had a use in these market conditions. Dungworth attributes the adoption of carbonated drinks as an important reason for increased demand for glass bottles.³⁸ A large number of both owners and clients of glassworks like Moss were breweries, supporting his claim. Widespread adoption of glass bottles therefore had roots in both supply *and* demand. Supply

³⁶ Miller & Sullivan 1984, p. 86. Daugherty 1928, p. 705.

³⁷ See Miller & Sullivan 1984.

³⁸ Dungworth 2012, p. 40

increased as production costs decreased, and demand increased with increased urbanisation as well as lower prices.³⁹

Unions

The relationship between labour and management is important when examining industrialisation, and therefore central to industrialisation of European glassworks. Industrialisation impacted both the required amount of labour, as well as what the required labour would do when working. These dynamics form an important context to the actions taken by both unions and factory owners. As mentioned, glassblowers were more specialised compared to other industrial workers at the time, and could not be easily replaced. This gave them and their unions more leverage, which plays an important role in regards to both cartelisation and modernisation. Glassblowers were expensive, and received in 1905 twice the salaries of normal industrial workers in Norway.⁴⁰ High wages and greater leverage than factory owners were comfortable with created incentives for mechanisation, to lessen the dependence on unionised labour.

While strikes took place, the glass bottle industry was relatively peaceful in terms of employee-union conflicts. Daugherty notes that there was little dispute within the industry, attributing it to several factors, one being that glass bottles were far less essential compared to other sectors like transportation or fuel, meaning that potential strikes were less noticeable to the society at large.⁴¹ Whether this was due to precautions taken by the manufacturers, or a different reason is hard to make certain.

³⁹ Dungworth argues this as well. (Dungworth 2012, p. 37)

⁴⁰ Hammer 1931, p. 79.

⁴¹ Daugherty 1928, p. 700

However, the fear of strikes would still have been present, which would influence the actions of the manufacturers, warranted or not. This was also the case in the Norwegian sector, where wages at Moss and Larvik were coordinated to avoid worker dissatisfaction.⁴² The gradual introduction of the Owens machine in Europe suggests that strikes were a concern.⁴³ The factory owners had to thread carefully when experimenting with innovation of production methods because of this, which is detailed later.

The lack of conflict left the industry to make agreements amongst itself, which arguably was exactly what happened. There are examples of close cooperation between unions and owners. Daugherty mentions an interesting example of this with the relationship between *The Glass Bottle Blowers' Association* and *The National Bottle Manufactureres' Association* which formed in the 1890's in the US. The two associations formed an organisation for collective bargaining, which prevented any strikes or lockouts within the industry after its adoption of a unique system of dispute settlement in 1902. Two committees who each had a high degree of centralised authority met to settle disputes regarding wages and working conditions. Any "interpretive questions" arising during negotiation were resolved by the president of the union. The committees would create separate agreements for each different division in the industry. These agreements were tough compromises however, with many of the negotiations having severe deadlocks, and certain agreements signed under protest.⁴⁴

⁴² Hammer 1931, p. 63.

⁴³ Miller and Sullivan 1984, p. 90. Biram 1958, p. 32N. These exact numbers are elaborated further upon in chapter 3.

⁴⁴ Daugherty 1928, p. 702-4.

Whether this collaboration benefited both sides equally is up for discussion. The employers benefited from continued operation not interrupted by strikes, and the employees benefited from having predictable wages and agreements ensuring their working conditions. That the agreements were hard to finalise does suggest that tough compromises were reached. Modernisation of the industry, which happened during the negotiated agreements, changed the industry in such a way both for employers and employees, and further complicated the already strained relationships within the glass bottle industry.

Industrialisation

Industrialisation affected the process of glass bottle production to a large degree. The sector has been described as nearly dormant in terms of technical developments up until the end of the 19th century.⁴⁵ The rapid change in rate of progression is hardly unique or surprising, considering other industries at the time. The modernisation process was gradual, and occurred in several steps. The first bottling machines were semi-automatic, meaning that workers had to load the machines with materials in-between production.

One example of such a machine is the *Press-and-blow* -machine, patented by Howard Ashley in 1880. Compared to later inventions, the machine can be likened to a tool operated by manpower. The mould was filled by hand, before compressed air blew the bottle itself. This method provided consistency, but it was still limited by how quickly the workers could fill the moulds.⁴⁶ Michael Owens developed the first automatic

⁴⁵ Cable 1999, p. 1093

⁴⁶ Dungworth 2012, p. 40. Miller and Sullivan 1984, p. 83

bottling machine, known as the Owens Machine, during the late 19th century, and was awarded a patent in 1903.⁴⁷ The machine filled the moulds automatically, greatly improving efficiency.

Other efficiency gains were achieved as well. First, the high skill requirement for blowing bottles had become less important, on account of the requirement for general factory workers instead of specialised glassblowers. The new machines produced approximately the same bottle both visually and quality-wise, regardless of who its operator was. This opened the labour market up in favour of the employers, diminishing the leverage that glassblowers had enjoyed in the past. Secondly, the rate of production was greatly increased, meaning that a single factory could manufacture vastly more bottles post industrialisation. American factories increased their production by 180 percent between 1904 and 1918.⁴⁸ It was established in 1927 that fully automatic machines were between 642 and 3806 percent more productive compared to hand made bottles. Labour costs decreased by between 90 to 97 percent.⁴⁹ This impacted the glass bottle market, as a larger supply and lower production costs meant that bottles became more available, and could be priced lower while still maintaining profits. It opened the industry up to mass production and -consumption. The Owens company initially licenced the patent to other bottle manufacturers in the US, before selling licence rights to the cartel.⁵⁰

The relationship with the labour market can be seen during the process of industrialisation as well. The first semiautomatic bottling

⁴⁷ Cable 1999, p. 1093. Miller and Sullivan 1984, p. 85

⁴⁸ Miller and Sullivan 1984, p. 83

⁴⁹ Miller and Sullivan 1984, p. 86

⁵⁰ Hammer 1931, p. 84

machines were introduced in factories where the workers had not unionised.⁵¹ This could mean that while factory owners were prompted to replace their workers due an uncomfortable dependency, they still recognised that conflict had to be avoided until they were certain of the new method of production. Angering the current labourers was a risk, but evidently one considered worth taking. Acquiring bottling machines was expensive, and the reduced production cost would not amount to any significant saving until years after introduction. Despite the many challenges, the industry was gradually mechanised.

Norway

The Norwegian glass industry had close ties to government institutions during its infancy and early years. This is no coincidence, as the government had more or less spawned the glass bottle industry in the name of mercantilism.⁵² The first Norwegian glasswork was established by *Det Kongelige Octroyerede Nordske Compagnie* (the Patented Royal Norwegian Company) in 1741.⁵³ The company had privileges to Norwegian natural resources on behalf of the Crown, but shifted focus to mainly glassworks after 1750.⁵⁴ Bottles were to be produced locally, and had to be protected from both domestic and international competition. While initially started by private actors, the government had to get involved to ensure the survival of the sector, and then allowed for privatisation during the 1820s.⁵⁵ The industry was entirely governed by

⁵¹ Miller and Sullivan 1984, p. 85

⁵² Hammer 1931, p. 3 - 9

⁵³ Hammer 1931, p. 4 - 5.

⁵⁴ Hammer 1931, p. 4.

⁵⁵ This is detailed by Hammer in his two first chapters. In addition to common contemporary measures such as import restrictions, the throne bought every share in Norwegian glassworks from the Royal Norwegian company in 1776 (p. 16).

the government until 1814. Glass production privileges were in place until 1803, when they were lifted and subsequently allowed for new actors to establish themselves.⁵⁶

The glass bottle industry had been run by private actors for nearly a century when the vast majority of modernisation, at least in terms of automation, occurred. This is not to say that the Norwegian glass bottle industry was entirely *Norwegian*, as foreign investment took place. Jørgensen's involvement in the consolidation process as well as Surte-Liljedahls Glasbruk establishment of Moss Glassverk are two examples.⁵⁷ The Norwegian glass bottle sector was small compared to other European countries.⁵⁸ This can be attributed to a small domestic market with no significantly large participants, neither on the supply or demand side, which subsequently provided no real incentive for glassworks to either scale up or innovate. Hammer mentions several smaller glassworks in *Den norske flaskeindustri* (1931), none of which did very well financially. The fact that Bergen glasswork shut down permanently after a fire in 1910 illustrates this. There was simply not enough capital to rebuild.⁵⁹

Modernisation led to centralisation in Norway. None of the Norwegian actors were large enough to participate in the cartel on their

⁵⁶ Hammer 1931, p. 22

⁵⁷ Hammer 1931, p. 52, 80-3. The thesis will return to Johan Jørgensen later. It is at this point sufficient to say that he was a Norwegian who moved to London and founded

⁵⁸ Exact production numbers are not available for this time period. Even so, the modest size can be derived from several factors, one being the small presence of Norwegian glassworks when the establishment of the E.V. was agreed upon (Biram 1958, p. 25N-26N).

⁵⁹ Hammer 1931, p. 87-88

own. Both Moss and Larvik wanted to acquire the licence, but lacked capital, forcing them to consolidate.⁶⁰

Larvik Glassverk

Larvik Glassverk was established in the 1870s as a result of an economic boom in the second half of the 19th century, in an attempt to support the emerging market for beer.⁶¹ The glasswork was run as a private company by Christian Christensen until 1888, when it was acquired by a holding company and subsequently transformed into a publicly traded share company. This was due to increased demand in the Norwegian market, and therefore a need for investments in production.⁶²

The industry had at the time experienced reduced supply, and the net increase in demand created ample opportunity for Larvik to expand its market share. Larvik competed with Moss from the latter's inception in 1897 until the two companies merged in 1913, after having had the same majority shareholder since 1907.⁶³ Larvik continued to operate with manual labour in the shadow of the fully automatic Owens machine at Moss until 1926, when operation ceased permanently.⁶⁴

Moss Glassverk

A decision to establish a glasswork in Moss was reached in late 1897 by the Swedish glasswork Liljedahl, who had Norwegian owners at the

⁶⁰ The concentration of Norwegian glassworks as well as the final days of operation in Larvik is detailed in Hammer chapter 9 and 10.

⁶¹ Hammer 1931, p. 37.

⁶² The initial shareholders were Sven Foyn, C. F. Isachsen, Erik Berg, Carl J. Christophersen and manager J. C. Smedsrud. The company consisted of 15 shares in total. Hammer 1931, p. 37-9.

⁶³ Hammer 1931, p. 82, 97-8.

⁶⁴ Hammer 1931, p. 116.

time.⁶⁵ Hammer does not state the exact reason, but official documents regarding import duties on glass bottles provides a possible explanation. There were no import duties on glass bottles of any kind before 1897, and the introduction of said duties made foreign manufacturers who exported to Norway rethink their strategy.⁶⁶ The table on the next page shows the immense impact that the import duties had on the glass bottle industry. Duties were applied to category 157 from 1898, which led to a decrease in imports of nearly 90 percent. Larvik Glassverk together with Christiania Glassmagasin asked the government for increased protection in 1905, but were declined as the responsible committee viewed the glass bottle industry as sufficiently protected.⁶⁷ The total duties on bottles was 0,02 kr/kg for green bottles and 0,03 kr/kg for brown bottles.⁶⁸ Whether this was a high fee or not can be hard to tell more than a century later, but looking at the decrease in imports suggests that exporting to Norway became less profitable. The establishment of Moss Glassverk by Liljedahl further supports this.⁶⁹

⁶⁵ Liljedals AB and Surte AB, two Swedish glassworks, merged in 1896. Liljedals was said to already have Norwegian owners, but this was not Jørgensen, as he entered all the Scandinavian glassworks during the early 1900s (evident by the fact that he did not hold any shares in either Moss or Larvik before 1900) (Riksarkivet 2006). Hammer claims that Christiania Bryggeri acquired Liljedal in 1873, which supplied the Norwegian market until import quotas were enacted. (Hammer 1931, p. 52.)

⁶⁶ Indst. S. 12 (1904/1905), p. 105

⁶⁷ Stortingsforhandlinger 1904/1905, p. 452. Indst. S. 12 (1904/1905), p. 107

⁶⁸ Indst. S. 12 (1904/1905), p. 105

⁶⁹ Hammer, 1931. p. 52-6.

Year	157	158	159
1898	1 401 580	102 810	34 963
1899	603 660	180 860	44 154
1900	157 340	159 170	96 273
1901	117 060	155 760	134 258
1902	194 760	62 870	95 890
1903	214 780	29 010	136 414
1904	147 330	35 590	153 679

Table 1: Imports of glass products to Norway 1898 - 1904 in kg.

157: Bottles made with green or brown glass, all types of beer bottles.

158: Bottles made with other types of glass.

159: Other glass containers (jars, balloons etc.)

Moss Glassverk was formally established on the 18th of January 1898. Several of the initial employees, including the first director Thorstenson, were Swedish, and had been employed at Liljedahls Glasbruk previously.⁷⁰ The founding members of Moss Glassverk consisted of both private investors as well as other companies, where most companies were breweries. 218 shares of 1000 kr were distributed, making the total market cap 218 000 kr.⁷¹ Moss and Larvik joined the

⁷⁰ Ringdal N.J. (1994). Moss bys historie. B. 3 : Perioden 1880-1990 : århundreskifte, mellomkrigstid, verdenskrig og rettsoppgjør, etterkrigstid, den nære fortid. Moss Kommune. p. 86-88.

⁷¹ Hammer, 1931. p. 59. No exact statistics of wages exist for Norwegian glassblowers in 1897, but the average wage was at the time 2,70 kr/day, according to Statistisk sentralbyrå, 2020. The salary for glassblowers was typically higher than average, which can be seen in the first section of chapter 4. Even so, 218 000 kr represents the annual salary of a significant number of workers.

E.V. through Johan Jørgensen's company together with the Swedish Liljedahl and Surte Glassverk. Jørgensen owned shares in all of the four companies.⁷²

Primary sources from *Trustkontrollen* in 1937 highlights the close relationship that Moss had to import regulation. Moss made an agreement with Czech manufacturers where the latter agreed to export a maximum of 200 tons of glass bottles to Norway, while the former agreed to not push for a ban on imports of bottles from the Czech manufacturers.⁷³ The reason for this agreement can be found in a letter sent from Moss to its shareholders and customers in 1938, where the glasswork had problems competing with firms from Belgium and Czechoslovakia on price.⁷⁴

The glasswork operated from December 1898 until 1999. Its closure was due to changing regulations, making production too expensive in Norway.⁷⁵ The government was therefore indirectly responsible for both the establishment and closing of Moss Glassverk, which displays the relationship between the Norwegian industry and political interests both in the industry's infancy and conclusion.

⁷² Biram 1958, p. 24N.

⁷³ Bryggeri og drikkevareforeningen (1937) "Overenskomst mellem A/S Moss Glasverk og de tsjekkiske flaskefabrikker."

⁷⁴ Moss Glassverk A/S (1912-1998) "Moss, den 29. Oktober 1938."

⁷⁵ Ringdal, 1994. p. 577-8. Nielsen, V. (2019) Hinkeklossen. Moss by- og industrimuseum. Retrieved April 27th 2022 from: <https://ostfoldmuseene.no/moss/artikler/lab1/hinkeklossen>.

Chapter 3: The Contracted Neck of Cartelisation

Consolidation within an industry can happen in many different ways. Merger is the most comprehensive form of consolidation, but may at times not be sensible due to legal reasons or diseconomies of scale.⁷⁶ Cartelisation can then be attempted instead, meaning concentration without outright merger. Cartels may share infrastructure, like marketing, suppliers and/or research, or operate completely separately, while having agreements in place for prices, production limits amongst others.

The topics of cartels and cartelisation are approached from the perspective of technology and innovation, due to their relationships with the E.V. Firstly however, a definition of cartels is presented, before the aspect of legality is discussed. The thesis itself will, due to the period of time in question, deal with legal cartels, but a review of this distinction is still relevant. Following this, the theory of patent pools is presented. Quality differentiation is then reviewed, before the chapter concludes with a presentation of the cartel in question, the *Europäischer Verband der Flaschenfabriken G.m.b.H.*

Definition

While several formal definitions exist, a *cartel* can be boiled down to a partnership between several actors within a sector or an industry, who capture a significant market share combined.⁷⁷ The cartel will create

⁷⁶ Stigler, G. (1964) A Theory of Oligopoly. *Journal of Political Economy* 72(1), 44-61. p. 45

⁷⁷ The literature will often remark cartels as being collusive, which makes sense considering the questionable legality of such partnerships in recent times. The term has mostly been omitted from this thesis however, as it is unreasonable when discussing legal cartels. In the cases where legality is questioned however, *collusion* is most descriptive.

certain rules and set certain expectations for how the members are to operate, examples being production quotas, prices as well as designated market share. In short, cartels are attempts at regulating certain types of competition. This does not mean that competition is completely eliminated, but rather transferred from one area to another. The cartel is to provide stability for its members, meaning that they can operate a profitable business without fear of being left behind in the market. Cartels are in most cases viewed as a negative contributor to the market economy today, as traditional competition is disrupted, and market entry often becomes difficult as a result.⁷⁸

Cartel Stability and Management

Cartel success has traditionally been measured in duration, which is not without its problems. The lifespan of cartels can be difficult to measure, especially in modern times due to the secrecy they are enveloped in as a result of their questionable legality.⁷⁹ Both internal and external factors can destabilise cartels. Internal reasons can be disagreements between the members, cheating, decreased profitability or increased risk. External reasons are mostly linked with antitrust, which will be reviewed in brief later in this chapter. These risks make cartels unstable organisations, and measures have to be taken to ensure their continuation. This can be done

⁷⁸ The conclusion that cartels are scrutinised today is derived from the fact that most countries have severely limited, or outright outlawed cartels. See Schröter 1996 for a detailed overview of the history of how cartels were treated politically. Most aspects of cartels are not covered in this thesis, as they do not apply directly to the E.V. However, Stigler 1964, Levenstein & Suslow 2006 as well as Dijkstra, P.T., Haan, M.A. & Schoonbeek, L. (2021) Leniency Programs and the Design of Antitrust: Experimental Evidence with Free-Form Communication. *Review of Industrial Organization* 59, p. 13–36 are good places to start for a general idea of what cartels are and how they operate, as well as how they might eventually fail.

⁷⁹ See Levenstein & Suslow 2006.

either punishing transgressing members, or within the structure of the cartel itself. Both are usually present when a cartel is formed.

Management of cartels can be done in many different ways, with a vast number of factors determining their individual success rate. The industry the cartel is formed within, the number of members, political backdrop and geography can make one management strategy have very different results in two seemingly similar cartels. Structural measures are discussed more extensively as the frameworks of patent pools and qualitative differentiation are expanded upon next.

Market Differentiation

A cartel can be managed with separate sectors of a market designated to specific members. These can be geographical where a member is given exclusive rights to operate, or at least preferential treatment, within a given area. The other members are discouraged from entering said area, which subsequently regulates competition. These designations must accompany changes in the market however - if one area increases market share to the detriment of another, the cartel must change its structure or else risk discontent, which could lead to instability. If there is evidence in the source material that suggests that members of the E.V. were encouraged to stay within a specific area, for instance by discouraging exports, a case could be made for geographic differentiation.

Qualitative differentiation is a different way to divide market share, which is concerned with the products or services themselves, rather than the geographical location of the cartel members. The individual firm is given a section of the market to operate in which is determined using price and quality. One market segment might value

quality over price, while another does the opposite. The cartel can therefore cover a larger market share and avoid intruding on each other by pertaining to different segments.⁸⁰ As with other types of designation, the divisions must be reevaluated continuously to maintain stability. If the upcoming review of the source material supports that members of the E.V. operated within the same geographical areas, but sold bottles to different prices, a case could be made for qualitative differentiation.

The Patent Pool

A patent pool is a common holding entity where patent holders transfer their rights.⁸¹ Being part of the entity grants rights to the use of patents, opening up the possibilities to restrict access to those excluded. It can be argued that the E.V. was a patent pool, as the Owens patent in truth was several patents, whose rights were transferred to the cartel by the Owens corporation.⁸² It should be noted that the members that formed the cartel did not have any patents themselves to begin with, meaning that the E.V. does not match Wu's definition completely, but still close enough that the description is fitting. Leaving the cartel would in this case be even worse compared to leaving a traditional patent pool, as the defector does not own any of the patents, and cannot take them when they leave. Leaving a patent pool is undesirable in any regards however, as the loss of access to technology represents a major setback.

Patents are not inherently problematic, even if they can be misused. An often cited argument in favour of patents is that of encouraging innovation. Being able to profit off of licences encourages

⁸⁰ See Bos and Marini 2019 for more on qualitative differentiation.

⁸¹ Wu 2019, p. 465.

⁸² Biram 1958, p. 20N - 21N.

development of new technology, not just for their potential in other ventures, but also as a way of making money off of the inventions themselves. Another less cited argument, which is particularly relevant when discussing the E.V. and the Owens machine, is that of technology transfer. Victor Menaldo examines this aspect using the Spanish Steel industry in 1850-1930, but the similarities to the European glass bottle industrialisation in the early 1900s are very apparent.⁸³ Menaldo argues that the transfer of technology is simpler when patents exist, as the patents provide a complete picture of the new technology, avoiding the adopters having to learn by doing. Being able to licence technology is also an incentive for the original holder to assist the adopters when implementing the new technology.⁸⁴

Patents are therefore an effective way of managing certain cartels, and applies well to the E.V. The pool that was contained within the cartel made it attractive to join, and unattractive to leave. As patent pool management is not completely binary, misbehaving members could potentially risk being restricted on licences, or losing access, which in turn promote good behaviour.

Legality and Government Intervention

Cartelisation is recognised by most as disruptive to market economics today, but that has not always been the case. Opinions differed during the late 19th century up until the Second World War. Harm Schröter divides countries into four different categories when their opinions on

⁸³ See Menaldo, V. (2021) Do Patents Foster International Technology Transfer? In Haber, S.H. & Lamoreaux, N.R. (ed.) (2021) *The Battle over Patents - History and Politics of Innovation*. (p. 69-111). Oxford University Press.

⁸⁴ Menaldo 2021, p 75.

cartelisation in between the second half of the 1800s and 1940. These opinions developed throughout the time period as well.⁸⁵ The first was positive towards cartelisation, the second ambivalent with some state intervention, the third generally ambivalent and the fourth prohibitive towards cartels.⁸⁶ The U.S. was firmly in the last category, with its implementation of the Sherman Act of 1890 and Clayton Act of 1914, both designed to promote competition in the private sector.⁸⁷

Germany and Norway on the other hand, were generally positive towards cartelisation. Germany had mostly cartels organised privately to begin with, but this changed as cartelisation was seen as an effective way of organising firms when preparing for war. Schröter places Norway in the same category as Germany, while Storli & Nybø points out that an important distinction even if both countries allowed cartels to operate. The German cartels were strictly monitored by the government, and while the Norwegians intended to do the same, it was challenging as many of the cartels operating in the country were international.⁸⁸

International corporations having influence over Norwegian business and natural resources was recognised as a threat by the government in the early 1900s, which eventually led to the implementation of the *Trust Act* in 1926.⁸⁹ The act did not outright ban cartels, but sought to monitor them closer than what had been done traditionally. Firms would have to apply to the government before

⁸⁵ See Schröter 1996.

⁸⁶ Schröter 1996, p. 141-2.

⁸⁷ See Storli, E. & Nybø, A. (2016). Publish or be damned? Early cartel legislation in USA, Germany and Norway, 1890-1940. In Fellman, S. & Shanahan, M. (ed.) *Regulating Competition. Cartel registers in the twentieth-century world*. Routledge. (17-29)

⁸⁸ Storli & Nybø 2016, p. 18.

⁸⁹ Storli & Nybø 2016, p. 26-7.

consolidation and close cooperation could take place.⁹⁰ The committee regulating such events was, according to Schröter, in favour of cartelisation, seeing the practice as a way of boosting the national economy.⁹¹

The sentiments towards cartels changed after the Second World War, when the heavily cartelised Germany had been defeated by the U.S., which prohibited these practices. Europe adopted the philosophy of competition. Schröter points out that total abolition of cartels was not intended to begin with, even those opposed to cartelisation had exceptions in mind.⁹² Nevertheless, cartels became less and less tolerated during the 1940s, and would largely not be allowed in Europe moving forward.

Die Europäische Verband der Flaschenfabriken

Establishment

The European glass bottle cartel was established in 1907. The cartel had members from several countries in Europe, including both Germany and Britain. Some of the members joined under a common owner, like Moss and Larvik, others in national associations such as the German and British firms.⁹³ Some notable European countries missing from the cartel were Belgium and France, who despite being part of the initial

⁹⁰ Storli & Nybø 2016, p. 27.

⁹¹ Schröter 1996, p. 134-5.

⁹² Schröter 1996, p. 142.

⁹³ The Deutscher Verband der Flaschenfabriken G.m.b.H. and The British Association of Glass Bottle Manufacturers Ltd., Leeds, respectively. While not mentioned specifically, there is reason to believe that the French and Belgian glassworks were organised into national associations as well, considering the size of their industries as well as Belgium's attempted partnership with Owens later on.

establishment meetings declined membership.⁹⁴ According to Biram, the E.V. was formed as a way of dividing the initial cost of acquiring the Owens licence.

An initial agreement between several German manufacturers had been dropped in favour of a larger, international organisation, which supports the decision of expanding the cartel outside of Germany.⁹⁵ The cartel agreement from 1907 shows how the power balance was weighted towards especially one of the national associations. The German firms held 47,6 percent of the E.V. capital, and the same share of the quota, which corresponded to 525,400,000 bottles per year. British manufacturers held the second highest share of capital at 27,3 percent, which corresponded to 301,000,000 bottles per year from the signing in 1907.⁹⁶ Biram does not specify whether the individual stakes were derived from production capacity or any other factors. It is therefore difficult to say that the cartel favoured German manufacturers based solely on the initial agreement. A majority of the firms in the cartel were located in Germany, and the country had at the time the largest bottle-making capacity of the members in the cartel.⁹⁷ It could be that the German manufacturers were able to acquire a large stake due to available capital, the attempted purchase of the licence alone at first suggests that they had a significant portion of the asking price already.

⁹⁴ Biram 1958, p. 26N. France wanted special privileges in the cartel, which the other members, except for Belgium, would not grant. Belgium was dependent on the French industry, and could therefore not join the cartel alone.

⁹⁵ Biram 1958, p. 22N.

⁹⁶ Biram 1958, p. 27N. Biram notes that the total share amount of 1 million gold marks was readjusted several times, and in 1955 was 20,000 marks (roughly 52,000 euros in 2022), of which German manufacturers held a 54 percent stake.

⁹⁷ Biram 1958, p. 26N.

Several other formalities were agreed upon during the initial meetings held in November 1907. The E.V. had a fixed duration until December 1919, which could be extended. The cartel had to approve members' requests for installing the Owens machine. The bottles produced by the new machines should initially only make up 10 percent of the total output of the cartel, and then only increase by a maximum of 5 percent the following two years.⁹⁸ The cartel would reevaluate production quotas following the first three years of operation. While there was no specific fixed price for bottles across the cartel, it was agreed that members were not to sell bottles in export markets for prices lower than the domestic cartel member.⁹⁹

Cartel Operations during the First World War

Having members from both sides of the ongoing conflict meant that business could not proceed as usual after the outbreak of war. Nevertheless, the E.V. continued operations, though with some modifications to the original structure. The British Association had to withdraw from the cartel in accordance with British law. It was told by its government that the agreements with the E.V. were not only suspended,

⁹⁸ Biram 1958, p. 32N. Miller & Sullivan 1984, p. 90. The two research papers quote these numbers differently. Biram states that the initial limit was 10 percent, and then only 5 percent the following two years, however Miller & Sullivan state that the limit was 10 percent initially and then was to increase by 5 percent annually. Their source references Biram, but implies that the figure in Biram is wrongly formulated (Barker, T. C. (1968) *The Glass Industry*. In Aldcroft, D. H. (ed.) *The Development of British Industry and Foreign Competition 1875-1914*. (p. 307 - 325.) University of Toronto Press, p. 317). Halving the production in the second year instead of starting with even lower production numbers for then to increase them would make for a strange decision if the objective was to quietly introduce the machine. This lends credibility to Barker's interpretation, but it is difficult to determine as the original agreement that Biram has based his article on is missing. This thesis assumes Barker to be correct, and will proceed with his interpretation.

⁹⁹ Biram 1958, p. 29N-33N.

but in fact void. The national association regarded it as suspended nonetheless, which allowed them to continue to licence the Owens machine.¹⁰⁰ This enabled them to continue operations of the existing machines, but not acquire new ones. As relatively few machines had been installed prior to the war, this arrangement proved to be unsatisfactory. The cartel refused to send new machines, and it also refused the American Owens Company to supply machines directly to Britain, as that would breach the original agreement between the Americans and the cartel.¹⁰¹

The disagreement led to a meeting at the Hague in 1916 between representatives for the E.V. and the British Association of glass manufacturers. The British Association had the consent of the British Board of Trade to sign an agreement with the E.V., and the E.V. had assurances from the German Home Office that it would not interfere.¹⁰² The agreement allowed for import of the Owens machine to neutral territories, which could subsequently be transported to Britain. The British Association did not rejoin the cartel after the first world war, but operated in parallel, with access to the Owens patent.¹⁰³

The cartel was to be liquidated in 1919 in accordance with the agreement from 1907. A liquidator was appointed when 1919 approached, while the E.V. continued operations. The process went on until 1927, when it was decided to revoke the liquidation, thus allowing operation for the time being. It did so until the Second World War, and continued to do so afterwards, though with large changes to the

¹⁰⁰ Biram 1958, p. 34N.

¹⁰¹ Biram 1958, p. 34N-35N.

¹⁰² Biram 1958, p. 35N.

¹⁰³ See Biram 1958 for more details regarding the new agreement between the E.V. and Britain.

agreement, due to the changing legality of restrictive cartels in Europe at the time.¹⁰⁴

¹⁰⁴ Biram 1958, p. 45N.

Chapter 4: The Making of a Market Leader

The following chapter will examine the relationship between Moss and the Cartel chronologically. First, the Norwegian glassworks' acquisition of the Owens licence, and how this resulted in market consolidation domestically is covered. The primary source material is lacking until 1916, and the section is thus predominantly based on Hammer's *Den norske flaskeindustri* (1931) instead. Second, operations during the First World War will be examined. This was a difficult period for Norwegian manufacturers, especially those requiring imports of raw materials, which the glass bottle firms did. The section will look into how coal imports became an issue, and how this was dealt with through the cartel. Telegrams from 1920 and 1921 detail how Moss and the cartel dealt with licensing fees and maintenance of the machine itself; this will be examined in its own section.

Finally, the issue of patents will be covered more extensively. Several companies entered the automatic glassblowing business after Owens, both with improvements to the existing patent as well as entirely new machines. Owens and its competitors attempted to consolidate this market as much as possible, leading to several agreements across continents and manufacturers. As the cartel in many ways were centralised around the Owens machine, it is intriguing to see how the introduction of new patents, as well as new actors affected both the cartel as well as Moss.

Obtaining Keys to the Castle, 1908-1912

The Race for Survival

The first section of chapter 4 examines the consolidation that took place within the Norwegian industry, which went on to initiate a race for an automatic bottling solution at the beginning of the 20th century. Hammer suggests that the three glassworks, Moss, Larvik and Bergen, all began to realise the advantage that the aforementioned machine would produce. Bergen discussed the acquisition of a licence in 1900, and Fredrik Thorsenson, a representative from Moss, visited Manchester in 1908 to see the Owens machine in person.¹⁰⁵ Moss subsequently considered acquiring a licence, but was unable to do so at the time, due to the high fees. Larvik did not have the required capital either.

Missing out on the Owens licence would be detrimental to the Norwegian market, which would be outperformed by international firms with capital and superior technology. Johan Jørgensen, a shareholder in both Moss and Larvik, and their contact in London recognised the importance of the licence.¹⁰⁶ He had the required capital to licence the Owens patent, which made him the actual cartel member, even if coordination and correspondence between the Norwegian and German parts of the cartel was between Moss, Larvik and the Düsseldorf office.¹⁰⁷ This meant that the licence became a joint venture between Moss and Larvik. As Larvik had a larger market share than Moss at the time, it was to pay 60 percent of the licensing fees owed to Jørgensen, while Moss was to pay the remaining 40.¹⁰⁸

¹⁰⁵ Hammer 1931, p. 69, 84.

¹⁰⁶ Hammer 1931, p. 82-4, 91.

¹⁰⁷ In Biram's (1958) overview of the representatives in the E.V.'s board, Jørgensen represents both the Norwegian and Swedish firms (p. 28N).

¹⁰⁸ Hammer 1931, p. 84-5.

Thus, the two glassworks had now in practice become exclusive rights holders to the Owens patent in Norway. However, it did not mean that production with the Owens machine started, or that it was settled where the machine should be located. The only initial benefit from acquiring the licence in 1908 seems to be that it prevented any other manufacturers from doing so, as well as restricting the other cartel members' access to the Norwegian market. While no net gain was provided, no losses had occurred either, except licensing fees. This was seemingly considered a worthwhile investment at the time, as the acquisition was made regardless of its downsides. Both glassworks wished to modernise their operations, and were ready to do so. Having the licence was therefore necessary, even if it could not be exploited right away.

The licence was only the initial step towards obtaining the Owens machine, which became the next ambition for Moss and Larvik. Bergen Glassverk pursued a merger with both Moss and Larvik after the fire in 1910, but the negotiation fell through, as the only offer Bergen received was 20 000 kr to cease operations indefinitely and transfer its remaining assets to its competitors in Moss or Larvik.¹⁰⁹ Bergen refused the offer.¹¹⁰ The proposal from Moss shows that there were strong interests in controlling the Norwegian market, which the Owens licence would contribute towards.

It is therefore clear that acquiring the machine was not just about increased efficiency, but also market dominance. While the source

¹⁰⁹ 20 000 kr was roughly equal to 15 annual salaries for a typical glassblower if they worked 6 days a week all year in 1910 with a daily salary of 4,28 kr. Average daily earnings for glassworkers are found in Det Statistiske Centralbyraa, 1913. p. 26. Average working hours in 1910 are found in Det Statistiske Centralbyraa, 1914. p. 2.

¹¹⁰ Hammer 1931, p. 87-8.

material does not indicate this directly, it is likely that the different players knew that whoever was the first to operate an automatic machine would gain a significant advantage to the detriment of the others. Especially Larvik's behaviour after the issue of location of the first machine was settled indicates this, more on that later. Hammer argues that it became a question of life and death for the shareholders at Larvik Glassverk.¹¹¹

Moss had planned to expand operations during its annual meeting in 1910, which according to Hammer was motivated by the fact that the current equipment needed maintenance.¹¹² The expansion also coincides well with the fire in Bergen earlier the same year, making it likely to have been a contributing factor. The Owens licence acquired previously would call for expansion too. There were therefore several good reasons for expansion in 1910.

Mechanisation of Moss and Its Consequences

Moss approached the cartel for a machine later in 1912. This seems to have been done without giving Larvik a notice, as it followed with its own application shortly after.¹¹³ Again, this highlights what Larvik perceived the consequences of not obtaining a machine would be. Much to the dismay of Larvik, Moss was granted the machine, with certain terms applied. First of all, the cartel required that Larvik was in agreement with Moss regarding the location of the machine. This was settled by their mutual majority shareholder, Johan Jørgensen.¹¹⁴ As

¹¹¹ Hammer 1931, p. 87.

¹¹² Hammer 1931, p. 88.

¹¹³ Hammer 1931, p. 90-2.

¹¹⁴ Jørgensen owned 75 percent of the shares in Larvik Glassverk and 58 percent of the shares in Moss Glassverk. Hammer 1931, p. 59, 81-83.

Jørgensen in fact owned the licence himself, Larvik had to align with his decision.

Secondly, production had to be held below capacity. The quiet introduction of the Owens machine discussed earlier mandated that only a tenth of the overall production was done mechanically. Jørgensen also had a set quota of production based on his capital in the E.V., which determined the total number of machines he would get across his firms in Norway and Sweden. The Norwegian market, which was perceived to be, and also was, small compared to other countries in Europe, therefore got a smaller share than the Swedish one, who acquired two machines instead of the one Norway got.¹¹⁵

Finally, exports could not be priced competitively with the local firm, this to avoid competition within the cartel.¹¹⁶ Moss ultimately agreed to the terms, and their machine was in operation by November of 1913. In the event that a second Owens machine was required, this was to be built at Larvik, however, that never manifested.¹¹⁷

Installing the Owens machine also made sense for Moss when analysing the aspect of expenditure. Looking at unions provides a good argument. Merely adopting the licence did not allow the factory owners to replace expensive workers right away, but provided significantly more leverage, as the glassblowers were about to become expendable. Constructing the machine would put the last figurative nail in the coffin. However, it is clear that acquiring the licence was about more than just

¹¹⁵ Biram 1958, p. 27N & 34N. The two machines acquired by Surte Liljedals AB were located in Surte Glasbruk, and installed in 1911 and 1912. (Holmér, G. (2017) *Flaskor på löpande band - arbete och arbetskraftsrekrytering vid Surte Glasbruk 1943-1978*. [Doctoral thesis]. Linnaeus University Dissertations. p. 73)

¹¹⁶ Biram 1958, p. 33N.

¹¹⁷ Hammer 1931, p. 93.

cutting costs. The initial investment was high, and the machine came with significant restrictions from the cartel.

Justifications for the large investment can be found when looking at the domestic competition in the glass bottle industry. Even with joint ownership, and some history of cooperation, Moss and Larvik were primarily competitors. Certain aspects of operation were beneficial to coordinate, like that of wages. Getting access to the machine, and perhaps especially thwarting the competitors' access to it, would ensure a significant technological advantage domestically. Judging by the small Norwegian market for glass bottles, a significant advantage would allow one of the firms to completely outcompete the other.

One can argue that the glassworks could manufacture different bottles to not encroach on each other's territory, but this does not consider that operations on the “manual” glasswork were significantly more expensive, meaning this manufacturer would slowly, but surely, lose to their competitor on every bottle produced. Being located closely to each other geographically did certainly not help Larvik’s case either, as its customers would have to pay roughly the same shipping cost domestically. This would have been a factor if Moss and Larvik were situated in different parts of the country from each other. Both manufacturers understood how critical it was to acquire the machine, which their competing applications show. This event is therefore important when examining consolidation within the Norwegian glass bottle industry.

Moss and Larvik had to agree on reducing their production as a condition to acquiring the machine. The Owens machine went on to spark

talks of merger between the two competitors.¹¹⁸ With Jørgensen owning shares in both companies, and Larvik no longer being able to compete, this makes a lot of sense. Moss wanted to purchase the remaining shares in Larvik, and was able to raise enough capital. Larvik proposed that the two firms form an entirely new company, but was turned down. Moss believed that its negotiating position was stronger than Larvik's for several reasons. With better margins before the acquisition of the Owens machine, Moss made the same amount of profit as Larvik despite lower production numbers, and a location closer to where the bottles were transported from meant lower costs as well.¹¹⁹ Being able to raise the required capital meant that Larvik's concerns did not have to be considered. Moss, Larvik and Bergen merged in 1913, and that Moss obtained the Owens machine is a likely reason for why the two other manufacturers would gradually disappear.¹²⁰ The machine naturally made Moss the centre of the new corporation.

It is interesting to contemplate whether this would have happened if Larvik had been granted the machine instead. The lack of mechanised production would affect Moss negatively, just as it did with Larvik, but Moss had several advantages, like those of margins and location. It is not stated whether these two factors played a part when the cartel decided to grant the machine to Moss, but it is clear that this would lead to the most efficient glass bottle industry, as the existing benefits could be coupled with the machine itself. There were strong interests in making the Norwegian glass bottle industry competitive with the rest of Europe, hence why Jørgensen acquired the Owens licence in 1908. Creating the

¹¹⁸ Hammer 1931, p. 94

¹¹⁹ Hammer 1931, p. 95-7.

¹²⁰ Hammer 1931, p. 97-8.

best possible manufacturer, both geographically and efficiency-wise was the only good solution to this issue. A fair conclusion to be drawn is that there were relatively minor factors that determined the location of the Owens machine, but the decision was all but insignificant, as it settled the power structure of the Norwegian bottle industry for years to come.

Collaboration and Trade During the First World War, 1915 - 1916.

This section analyses material which originated during the First World War, to look at how the Norwegians handled this challenge. Some of the happenings within the cartel itself can also be derived from these sources, and this is an issue elaborated upon in chapter 5.

Having settled the dispute regarding the machine's location, operation could commence. That is not to say that the manufacturing in Norway was completely unproblematic. The first correspondence between the manufacturers in Norway and the cartel and its German members from the archives was sent in 1916. The correspondence is in the shape of telegrams sent from Larvik and Moss to *Gerresheimer Glashüttenwerke*, one of the largest German members of the cartel, as well as a telegram sent from the cartel to Moss. Several of the remaining documents from 1915 and 1916 are letters to Moss' British contact as well as letters sent from Moss to its shareholders and customers.

Between a Rock and a Hard Place

The First World War was well underway at this point, and while Norway remained neutral during the war, trade conditions became difficult as a result of the conflict. A circular letter sent from Moss to its shareholders and customers in May of 1915 informs that neither of the three Norwegian glassworks, Bergen, Larvik or Moss, were able to manufacture brown glass due to a lack of required raw materials. These were usually imported from suppliers in the Caucasus, but the war had made it impossible to stay in contact.¹²¹

¹²¹ Moss Glassverk A/S (1912-1998) "Cirkulære Kristiania den 26de Mai 1915"

Later in September the same year, Moss sent a letter to *Norsk Bryggeriforening* (Norwegian Union of Breweries), noting that it was unable to produce enough bottles, and could therefore not honour agreements regarding regular shipments. The price of bottles was increased by 15 percent for both full and half bottles. In addition, a war surcharge of 350 percent was applied to all shipments.¹²² Reading correspondence from Gerresheimer reveals Moss' solution to its shortage issue. The telegrams detail orders of bottles from Germany to Moss. A shipment of 10 tons is mentioned in a telegram from October 1916, and Moss seems to have ordered an additional one million bottles, as a telegram sent from Germany in November confirms this.¹²³ The correspondence with Germany is noteworthy considering their involvement in the war. Moss was able to acquire shipments from Germany during the war through its cartel connections.

The Norwegian firms were thus in an challenging position, as their connection with Germany ensured that they could fulfil their orders to any degree at all on one hand. On the other, other suppliers, like those in Britain, would restrict trade with Norway due to this partnership with their enemy. Paradoxically, the agreement would help Moss maintain some activity, while ensuring that it would not be able to obtain materials needed for its own operation. However, ceasing trade with Germany would in no way guarantee British shipments either. Choosing to resell bottles instead of manufacturing is generally unwise financially speaking,

¹²² Moss Glassverk A/S (1912-1998) "Til Den Norske Bryggeriforening", 28.09.1915

¹²³ Moss Glassverk A/S (1916-1923), Gerresheimer Glashüttenwerke to Moss, October 31, 1916. (Letter starts with "Wie Sie vermutlich selbst schon festgestellt haben werden".

Moss Glassverk A/S (1916-1923), Gerresheimer Glashüttenwerke to Moss, November 3, 1916

as expenses tend to increase with the number of links in a given supply chain. The import from the cartel must therefore have been seen as absolutely necessary.

It is significant that the orders were not of excess stock that Gerresheimer already had manufactured. In a telegram sent in September of 1916 from Gerresheimer to Moss states that Moss had ordered bottles to be manufactured. The telegram confirmed that Gerresheimer would be able to ship bottles to Moss with the specifications that were requested. Specifically, the bottles were to have a bottleneck that seems to not have been used in Germany originally, as Moss had sent prototype bottlenecks which the manufacturer was to copy. Gerresheimer expressed that the request for the custom-made bottles was to be produced as soon as possible, suggesting that resource procurement was a challenge outside of Norway as well.¹²⁴

Telegrams from Larvik to Gerresheimer in the autumn 1916 suggest that shortage was a problem for other Scandinavian firms as well. Larvik requested a shipment of 150 000 half bottles and 250 000 full bottles to be delivered to Dahls by the end of the year.¹²⁵ These bottles were to be made like the Norwegian ones, again supporting the idea that the Norwegian manufacturers were supplementing their own shortage of stock with supplies from other cartel members. A telegram from Larvik to Dahls was also present in the archive. Here, Larvik confirmed that it had been ordering bottles to fulfil orders, and also that this had not been financially sound short-term, as it had to pay both for the finished bottles

¹²⁴Moss Glassverk A/S (1916-1923), Gerresheimer Glashüttenwerke to Moss, September 26, 1916.

¹²⁵ Moss Glassverk A/S (1916-1923), Larvik to Gerresheimer Glashüttenwerke, October 19, 1916.

as well as the shipping cost. Larvik emphasised that it was still going to continue this practice, seeing that maintaining good relations with its customers was a top priority.¹²⁶ Later on, Larvik informed Gerresheimer that Dahls had received an offer of “gerresheimerflaschen” from Copenhagen.¹²⁷ This reads as a reference to bottles resold from Gerresheimer, meaning that the practice existed also outside of Norway. Larvik requested that the Danish deal be prevented, and that further export to Norway from Denmark was disallowed. A question that could be raised at this point is that of pricing of imported bottles. From the agreement mentioned in chapter 3 of this thesis, it is clear that bottles could be exported, but not at competitive prices. If this still was the case during the war, the Norwegians would have had to buy bottles at uncompetitive prices, *and* pay the customs fees that Germany did not pay themselves.

Larvik was not just limited by material shortage however, as a telegram sent to Gerresheimer in October of 1916 suggests. Larvik tried to negotiate lower prices on imported bottles, and all bottles sold in Norway went through Moss or Larvik, as this would allow them to estimate Norwegian consumption. This further supports that one of the reasons it had to import bottles was that it could no longer satisfy the Norwegian market. Larvik stated that it would continue to import bottles until the cartel allowed for a larger production quota in Norway.¹²⁸

¹²⁶ Moss Glassverk A/S (1916-1923), Larvik to Herr H. Stoltz (Dahls Bryggeri), October 19, 1916.

¹²⁷ Moss Glassverk A/S (1916-1923), Larvik til Gerresheimer Glashüttenwerke, October 27, 1916.

¹²⁸ Moss Glassverk A/S (1916-1923), Larvik to Gerresheimer Glashüttenwerke, October 19, 1916.

This is significant. The push for larger quotas from Larvik suggests that the existing ones were far below demand. One can then speculate if the original quotas were purposely low so that the German members could export into other markets. Gerresheimer, the German manufacturer, originally tried to acquire the Owens licence in 1907 with three other German firms, but ended up forming a cartel with several others instead.¹²⁹ They ended up with nearly half of the quota on bottle production, as mentioned in chapter 3.

German Favouritism?

While the cartel had members in several European countries, many manufacturers were German, and the office in Germany was the one handling most communication. The archives include mentions of correspondence with other manufacturers as well as cartel members with other functions, like Schwarzkopf in Berlin, who were responsible for spare parts. It is therefore not entirely unreasonable to assume that German economic considerations were important to a cartel with many of its critical functions located in Germany.

This way, the cartel could ensure that other European manufacturers did not intrude on the German market as their production quota did not allow for exports, at the same time as the German cartel members had convenient export channels. The fact that the bottles exported from Gerresheimer were not part of excess stock complicates this interpretation somewhat. If the plan from the start was to intrude on foreign markets, why reduce profits by producing a different type of bottle? Being able to get rid of excess stock if needed would also be very

¹²⁹ Biram, 1958. p. 21N

convenient, so it is strange that the German firms did not capitalise on this opportunity.

The fact that Gerresheimer had to manufacture the required bottles does not support the theory of using the cartel for “dumping”, at least not at the time. If the Norwegian manufacturers had the resources to produce their own bottles, it would have been inefficient to have them made in Germany instead of temporarily, or permanently, raising the Norwegian quota. This strengthens the claim that there actually were issues with procuring raw materials in Norway, which other sources support, making one question why Larvik would point to quota limits if it was unable to fill the quota in the first place. As it was Larvik pushing for larger quotas, this could have been to pressure the cartel into allowing them to operate a second Owens machine to compete with Moss, but there is no source material directly suggesting this.

The quiet implementation strategy mentioned in chapter 3 provides a possible explanation to the seemingly illogical quotas. This would possibly explain why Moss and Larvik accepted the low quotas initially, as it was supposedly only for a relatively short amount of time. Larvik pushing for higher quotas can therefore almost be considered an act of desperation, as it knew the quotas would increase over time. However, this might not have been fast enough for Larvik, who relied on higher quotas if it was to gain access to a machine themselves.¹³⁰

¹³⁰ Having said this, the required increment to the quota was considerate. Looking at the machine distribution compared to the quota distribution in Biram on pages 33N and 27N respectively makes it possible to make a rough estimation. The Norwegian and Swedish quota was 32 million bottles in 1907, with access to 3 machines in total, 1 in Norway and 2 in Sweden. The next association in regards to quota size was the Dutch with 66 million bottles and 7 machines. Assuming that any quota gains only applied to the Norwegian firms, which is unlikely, a raise to at least 40 million bottles was needed to increase the machine count, this is an optimistic estimate however.

Another way of framing the possible German advantage in the cartel is to look at the possibility of the opposite taking place. It seems very unlikely that manufacturers outside of Germany would gain advantages in a cartel that operated much of its production, and most of its administrative and supportive functions out of Germany. The bottles exported to Norway could have been produced locally if quotas were raised. Incidental or not, the cartel ensured that German manufacturers could maintain higher production numbers, while having an easy way of exporting to other markets. If intentional, this would mean that becoming a member of the cartel gave Moss the advantage of new technology, while being restricted on international trade and giving German manufacturers access to the Norwegian market.

British Restrictions

Trade with Britain became challenging during the First World War. While staying neutral, the Norwegian industry could in theory keep trading with both the Central powers and the Entente at the same time. In practice however, relations with the Entente, Britain in particular, became very strained. The British government was hesitant to restrict trade with the neutral Scandinavian countries to begin with, not wanting to upset relations without having proof of trade with Germany.¹³¹ Facing increased public as well as political pressure, the British Government first limited the Norwegian fishing industry's trade by purchasing Norwegian excess fish, thereby preventing trade with Germany.¹³² Later in 1916, Britain

¹³¹ Strøm, K.O.N. (2019) *Between the devil and the deep blue sea - Trade negotiations between the Western Allies and the Scandinavian neutrals 1914-1919* [Doctoral thesis]. University of Gothenburg, p. 134.

¹³² Strøm 2019, p. 143.

attempted to force Norway to cease exports of sulphur to Germany. This was only partly successful, as general exports were stopped, but exports of pyrite with a low concentration of sulphur continued. The Norwegian government claimed that the specific pyrites were not covered as they were not categorised as cuprous during peace time. Britain regarded this as fraud, and subsequently barred all exports of coal to Norway between the end of December 1916 and February 1917.¹³³

Moss received a letter from the customs department in September 1916 with instructions regarding exports, showing that the Norwegian government was involved in the operation of private enterprise. The letter clarified that no goods were to be transported outside of Norway without confirmation from customs. The exporter was required to inform the customs of the origin of the goods, as well as when it originated and who the importer was. Crucially, if the goods exported had been manufactured domestically with raw materials which originated outside of Norway, these materials had to be declared the same way as goods wholly imported. Infringing on the law was punished with fines.¹³⁴ This was at the height of British interference in Norwegian trade during the war, and while the Norwegian government was somewhat reluctant to obstruct trade with Germany, this letter shows that the threat of restrictions from Britain was taken seriously.

The correspondence between Moss and its contacts in Britain illustrates the difficulties that Norwegian firms were facing at the time. Moss sent a telegram to the British Legation in September 1916,

¹³³ Strøm 2019, p. 148

¹³⁴ Moss Glassverk A/S (1916-1923), Det Kongelige Finans- og Tolddepartement, cirkulære til Moss, September 29, 1916. Infringements were to be punished using the Norwegian penalty code section 339, which regarded failure to declare information to the government (Straffeloven 1902, §339).

requesting a licence for coal exports. In the telegram, Moss conveyed several statistics regarding its coal stock and consumption. It had about 2400 tons of coal in stock at the beginning of the year, but due to difficulties in securing more, it was now down to 550 tons. Its consumption was 650 tons each month, meaning that it would not be able to operate for another month.¹³⁵ This makes it understandable why the manufacturer had started to order bottles from other cartel members, as the alternative was to shut down operation relatively soon. Having some stock could at least tide them over for a short while.

One can assume that procuring coal from Germany was not possible at the time, or at least assumed not to be possible, as the Norwegians surely would attempt to secure raw materials from its partners before it decided to import finished bottles. Rudolph Daleng, one of Moss' contacts in Britain, reported in November 1916 that he had been able to secure a shipment of coal, which could be shipped during the remainder of 1916. The coal was of a different type compared to the one Moss traditionally used, but the contact assured that this type was well suited for glassblowing.¹³⁶ The telegram was sent in the beginning of the month, and the British government banned all exports of coal to Norway in late December. There were other telegrams directed to Moss at this period of time, one from *Bugge & Olsen* and one from *pr.pro. C. Hemsén*, both offering coal transports.¹³⁷ These are responses to requests sent by Moss, which strengthens the claim that Moss was desperate to secure coal for the next months. The offer from Bugge & Olsen would not be

¹³⁵ Moss Glassverk A/S (1916-1923), Moss to The British Legation, September 14, 1916.

¹³⁶ Moss Glassverk A/S (1916-1923), Rudolph Daleng to Moss, November 4, 1916.

¹³⁷ Moss Glassverk A/S (1916-1923), pr. Bugge & Olsen to Moss, December 1, 1916. Moss Glassverk A/S (1916-1923), pr. pro. C. Hemsén to Moss, December 6, 1916.

shipped until January however, meaning that it would never materialise. The other offer was sent on the sixth of December, making it possible in theory that this shipment was sent before the ban. The source material does not indicate whether or not this happened. Considering response time, as well as the fact that the shipping company did not actually have the coal at hand, it seems unlikely that it could have shipped the coal before the ban.

Customs and Price Fixing

Another issue Moss faced during the war was customs. From telegrams sent to Moss in September of 1916, the cartel was to pay import duties on shipments to Norway. This was brought up in the telegram, as Moss had earlier informed the cartel that it had been charged import fees. The cartel clarified that this was a misunderstanding, and that the customs charged duties to either the sender or recipient seemingly arbitrarily.¹³⁸ This was related to the purchase of bottles from Germany, as the same telegram confirmed that following shipments would include the bottleneck mentioned earlier in this chapter.¹³⁹ Larvik also mentioned the issue of customs in a telegram to the cartel in October of 1916, where it had been charged, and wondered where it was to send the receipt to receive a refund from the cartel. While the issue of customs did not present large problems for the partnership between the Norwegian manufacturers and the cartel, the telegrams made it clear that customs were an important part of the signed agreement. It also highlights the difficulties of operating

¹³⁸ Moss Glassverk A/S (1916-1923), E.V. to Moss, September 26, 1916.

¹³⁹ Moss Glassverk A/S (1916-1923), Larvik to Gerresheimer Glashüttenwerke, October 19, 1916.

across borders at a time where communication was relatively slow, and as well as there being a war raging.

Correspondence between Larvik and the cartel, as well as information sent from the Norwegian manufacturers to their owners and customers reveal the extent of the cartel's ability to fix prices. War-surcharges were applied to varying degrees during the war, depending on the cost of operation. Larvik explained in a telegram to the E.V. that while it had raised prices to the level that the cartel had requested earlier, it chose to adjust the base-price of its bottles, which allowed them to apply the same surcharge to all of its bottles. Larvik claimed that this was done to not confuse its customers.¹⁴⁰

The cartel's influence did therefore not extend to the specific cost components, but rather to the total price. The source material does suggest that certain breweries did consider imports, like Dahls mentioned earlier. There are no mentions of this being due to variation in price, but it is also not hard to imagine that a company like Dahls would rather procure bottles from Copenhagen if it was cheaper to get them from Norway. The bottles, having both originated from the same German factory, would not vary much in quality either. It is therefore interesting that the different components of the total price of glass bottles could vary across borders, even if this was an advantage not often exploited.

¹⁴⁰ Moss Glassverk A/S (1916-1923), Larvik to E.V., October 30, 1916.

Maintaining and Upgrading the Machinery, 1920 and 1921

The source material from 1921 is quite comprehensive. The correspondence, which mostly takes the shape of telegrams sent from the cartel in Germany to Moss, details aspects of the licensing agreement between Moss and the cartel. This section will therefore focus on how the cartel operated in regards to patents.

Licensing Fees and New Patents

Moss paid a set royalty for every one hundred bottles it produced with the Owens machine.¹⁴¹ These licensing fees were paid to *Bryn Patentkontor*, a Norwegian patent office, where the cartel had an account.¹⁴² Due to this price structure, it was important that the cartel had exact production numbers. This data was provided twice a year.

The correspondence shows that the cartel would request the data if it was not received when expected. That was the case with Moss, as can be seen in telegrams from November 1920, as well as January and February 1921. Moss was to report its production numbers for the first half of 1920 in July of the same year, and the cartel requested this report in November as it had been missing thus far.¹⁴³ The exact date of Moss' response is not stated, but the cartel sent another telegram confirming that it had received production numbers in the beginning of December 1920. Moss had produced in total 1 704 275 bottles during the first half of the

¹⁴¹ Biram 1958, p. 29N.

¹⁴² Moss Glassverk A/S (1921), E.V. to Moss, January 15, 1921. While the telegram does not specify that the fees are to be paid to Bryn Patentkontor, it does say that the fees are to be paid to "your patent office", which was Bryn in this case.

¹⁴³ Moss Glassverk A/S (1921), E.V. to Moss, February 4, 1921.
Moss Glassverk A/S (1921), E.V. to Moss, February 14, 1921.

year.¹⁴⁴ The cartel then requested at the end of December that Moss would report the production numbers for the second half of 1920 no later than the 10th of January 1921.¹⁴⁵ Another request came in the beginning of February of 1921 asking Moss to provide total production numbers for the entirety of 1920. Whether the cartel had received numbers for the second half of the year is not stated. The complete numbers had to be provided due to a quota meeting in March of 1921.¹⁴⁶ The telegrams show how important it was for the cartel to monitor the production of their members.

Moss did acquire a new patent in 1920. It was licensed through the E.V., who cooperated with Hartford Empire, the American patent pool mentioned in chapter 3. Hartford was developing a competitor to the Owens machine.¹⁴⁷ Its machine differed from Owens' by using a different method for feeding glass into the moulds. The original method, called suction-feeding, was replaced with what was known as gob-feeding. Owens developed its own gob-feeder, and both companies attempted to patent the invention. As its patent applications conflicted with each other, conflict ensued. The result was that Owens kept the rights to suction-feeders, while Hartford gained exclusive rights to the gob-feeder. Hartford also gained rights to the Owens machine in Europe, which it licensed through the cartel. This meant that the Owens machines in Europe could be equipped with a gob-feeder. Owens did in return receive

¹⁴⁴ The Norwegian and Swedish quota was in 1907 a total of 32 million bottles. It was likely raised between 1907 and 1920, meaning that the bottles produced in Norway by the Owens machine represented less than 5 percent of the total quota.

¹⁴⁵ Moss Glassverk A/S (1920), E.V. to Moss, December 2, 1920.

¹⁴⁶ Moss Glassverk A/S (1920), E.V. to Moss, December 2, 1920.

¹⁴⁷ Moss Glassverk A/S (1920), Bryns Patentkontor to Moss, January 5, 1920.

rights to use the Hartford gob-feeder in the US.¹⁴⁸ Hartford subsequently started delivering equipment to several manufacturers in Europe, with stipulations concerning exports of the machine itself. The machine was not to be exported to the US, and not to other territories where existing licences were to be found. Hartford did not licence its own machine at the time, only the feeding mechanism.¹⁴⁹

Spare Part Restrictions

Correspondence from April and May of 1921 details Moss' attempts at procuring spare parts through the cartel.¹⁵⁰ The order was delayed, which was the reason for Moss' second telegram. The cartel contact assured Moss that the parts were being sent in several shipments, and apologised for the delay.¹⁵¹ If the machine was out of commission, Moss would subsequently have to severely limit, or even shut down production, causing issues with fulfilling existing contracts.

Source material explored earlier suggests that gaps in production could be filled by other cartel members. This is far from ideal however, as it could threaten Moss' Norwegian market share if temporary deals with a different manufacturer were to become more permanent. The Dahls example shows that there were opportunities for Norwegian breweries to obtain bottles from foreign sources, and while the Norwegian firms requested for this activity to stop, there are no sources confirming that this actually happened. It would be hard for the Norwegians to make any demands as they were dependent on being

¹⁴⁸ Hexner 1948, p. 364. Hartford would go on to acquire all of Owens' patent rights in 1924 (Wu 2019, p. 471).

¹⁴⁹ Hexner 1946, p. 364.

¹⁵⁰ Moss Glassverk A/S (1920), E.V. to Moss, April 18, 1921.

¹⁵¹ Moss Glassverk A/S (1920), E.V. to Moss, May 27, 1921.

members of the cartel to access the Owens machine, and they did not have many realistic alternatives if the cartel was to refuse its request.

Correspondence between Moss and Schwartzkopf from October 1916 suggests that there were restrictions on spare parts. Moss had to declare that the parts it had ordered were only to be used in its own factory, and not exported internationally. The reason for this was that Schwartzkopf had exclusive rights on spare parts, but it is not clear whether this was due to just cartel restrictions, or if these restrictions were made by the German government in time of war. The spare part manufacturer explained that it required this confirmation from Moss to be able to acquire an export licence, which suggests that the German government was involved. The confirmation had to be written, and was to be attached to any subsequent orders.¹⁵²

The difficulties with spare parts and maintenance highlights the importance of the Owens machine to Moss. It was willing to accept that production could stop for periods of time due to maintenance, in addition to having cut production far below capacity. For Moss, these sacrifices made sense in order to operate the machine, they had no choice but to comply.

¹⁵² Moss Glassverk A/S (1916-1923), Berliner Maschinenbau-Actien-Gesellschaft Vormals L. Schwartzkopfe to Moss, October 30, 1916.

From Owens to Lynch, 1927.

Hardware Replacement

It was mentioned at the annual meeting of 1925 that dumping had become an issue for the Norwegian glasswork, and it was not able to compete on price with the current technology.¹⁵³ As a result, improvements to manufacturing, both to increase efficiency and reduce costs were required. Hammer details how C. J. Smedsrud, a representative of Moss, went to the US in 1927 to inspect a new bottling machine made by the Lynch company, the Lynch type R.¹⁵⁴

The replacement of the Owens machine did not represent a break between Moss and the cartel. If anything, it illustrated how consolidated the market had become, both in terms of production as well as research and development. Hartford Empire had struck a deal with the Owens Company in 1924, which granted them exclusive rights to the Owens licence. The Owens Company gained access to Hartford's patent pool in return.¹⁵⁵ While the sources are not specific on the topic of whether the cartel had access to Hartford's pool, this seems to be the case. Firstly, the cartel and Hartford had made agreements on the gob-feeder previously.¹⁵⁶ Secondly, Biram lists the structure of the organisation in 1955, with Moss still being present.¹⁵⁷ One can reasonably expect the largest partnership of

¹⁵³ Hammer 1931, p. 116.

¹⁵⁴ Hammer 1931, p. 122.

¹⁵⁵ Wu 2019, p. 471.

¹⁵⁶ Hexner 1948, p. 364.

¹⁵⁷ Biram 1958, p. 27N - 28N. It is tempting to call the E.V. a cartel out of habit, but this was no longer true in 1955. While the organisation still existed, and cooperation still took place, it was for all intents and purposes no longer an actual cartel. Biram describes the organisation as more of a loose partnership without the restrictive elements of the original agreement of 1907 (44N - 45N). It is however noteworthy that the organisation survived with most of its original members through these radical structure changes.

bottle manufacturers in Europe to cooperate with the largest patent pool, considering the economic benefits for both parties.

The agreement between the cartel and the Owens Company had turned sour as well. A lawsuit was filed by the E.V. against their partner in the late 1920s claiming a breach of the original agreement.¹⁵⁸ Belgian manufacturers were, as mentioned earlier, not members of the cartel. The Owens Company had attempted to grant them licences to a different machine, which the E.V. strongly opposed to. Owens was at the same time opposed to the E.V. having claimed patent rights to improvements done to the original patent. The lawsuit ended with the E.V. retaining exclusive rights to both the Owens machine as well as several other patents and the improvements they had made themselves, and the Owens Company ended their partnership with the Belgian association.¹⁵⁹

The legal battles and transition from the Owens machine to the Lynch machine illustrates how important the cartel connection was to Moss. It was still a small player in the European market, but managed to access new technology even so. Moss would never have been in the possession of any licence at all without the cartel, and if they had been, they would not have been able to respond to the same extent as the E.V. did when Owens towed the line of their agreement.

It is not clear why Moss went with the Lynch type-R instead of an improved Owens machine, but the timing of their transition could offer an explanation. The Lynch machine was installed in 1927-1928, which was during the aforementioned lawsuit. With the patent rights being in something of a limbo, it was likely viewed as safer to purchase the Lynch

¹⁵⁸ Hexner 1946, p. 364.

¹⁵⁹ Hexner 1946, p. 364. Biram 1958, p. 41N.

machine. Patent-pool management can also explain the acquisition, but the source material does not mention if the cartel decided that Moss was to acquire a different machine. It was a large improvement on Moss' original equipment, which made the manufacturer able to compete with dumping.

Now What?

The Lynch machine acquisition concludes the coverage of Moss' involvement with the cartel. By joining the cartel, Moss had gone from being one of several Norwegian manufacturers within the glass container industry, an arguably insignificant one compared to the European one at the time of the E.V. 's inception, to becoming a domestic market leader and being presented with important opportunities despite its modest size. Having reviewed the timeline of the Norwegian industry from 1908 to 1927, a few conclusions can be drawn in the final chapter.

Chapter 5: Overarching Observations and Conclusions

Moss Glassverk exited the 1920s as a domestic market leader. Instead of surpassing its competition, it chose to consume it. The path to the top was certainly not without its hurdles, but they managed to overcome them.

The fifth chapter circles back to the research questions and hypotheses from the first. These are reexamined in light of the background information presented in this thesis, as well as the analysis from chapter four, this time thematically. The first sections analyse reasons for the Norwegian firms to join the E.V. and how this changed the environment in the Norwegian sector of the industry. Understanding why the E.V. was formed and its justification for letting the small Norwegian firms in follows. Then, the thesis returns to cartel management to determine how the E.V. was managed, which in turn helps understanding its influence on the Norwegian industry. Quotas have been a topic of discussion throughout the previous chapter of this thesis, and are dealt with before suggestions for further research are proposed. Finally, the thesis' conclusions are drawn.

Levels of Consolidation

How did domestic concentration influence international consolidation, and how did the international conditions affect domestic firms? On the surface, domestic and international cartelisation might not seem related, but by figuratively taking a deep breath and diving into the source material, this conclusion is revealed as hastily drawn and incorrect. There were occurrences of domestic consolidation in the European glass bottle

industry prior to the E.V. Biram mentions several, those being German, British, Austro-Hungarian and Dutch associations.¹⁶⁰ The German association wanted to acquire the Owens licence, conceivably to dominate competition domestically, but ended up forming an international cartel to minimise the expense to the German industry. From this angle, one can draw the conclusion that domestic consolidation contributed to the international one.

However, the former conclusion can be turned on its head. The Norwegian industry was cooperating on certain issues, like that of wages and the type of relationship the manufacturers were to have with unions, but were largely competing internally on other issues. Bergen ended their independence due to unfortunate circumstances. Moss and Larvik were both established in the market, and while neither can be said to have performed exceptionally, none of them were struggling either. The introduction of the Owens licence changed this aspect, and the two competitors merged in 1913. Not only that, but their majority shareholder held large positions in Swedish glassworks as well. Jørgensen's acquisitions happened in 1906, as a result of the expected mechanisation of the industry. He was open about the wish for consolidation, and if that proved difficult, close cooperation in the Norwegian industry at least.¹⁶¹ The link between innovation and consolidation was a fact.

With that being said, why would German manufacturers opt an international cartel rather than acquiring the Owens licence for themselves? Norwegian import duties might provide an answer. The issue of imports is discussed in the primary source material, as well as in

¹⁶⁰ Biram 1958, p. 26N.

¹⁶¹ Hammer 1934, p. 81-2.

Hammer's *Den norske flaskeindustri* (1931). The establishment of Moss can be traced back to import duties in 1898, and was likely the reason for why Jørgensen was able to join the E.V. in 1907 with his Swedish and Norwegian firms. The economies of scale present in Germany would almost certainly outperform an unprotected Norwegian industry, supporting that market protection made a larger cartel desirable. While the cartel discouraged exports, fear of competition seems unlikely to be a reason for cooperating with the Norwegian firms. Compared to other members, Moss and Larvik were small. Restricting them from the Owens machine would furthermore make them even less of a threat to the European glass container market. Excluding the Norwegians would however contribute to a different perceived threat, which will be discussed shortly when examining cartel management.

The benefits of Norwegian membership were therefore seemingly modest to the cartel. It got partners in a market protected by duties, but would still have to pay these if they were to export, which the primary source material supports. The Norwegians were no real threat to the other members if they joined, due to a small quota, but would not have been a threat if they remained independent either, as the industry was too small and not efficient enough without access to the Owens machine.

The consolidation at the domestic and international level in the European glass container industry can therefore be said to have been closely connected. Not only did domestic consolidation spark talks of international cartelisation, but the cartelisation promoted domestic consolidation in the remainder of the industry. The international partnership was voluntary, in the sense that one was not forced to join, just severely disadvantaged if not, the consolidation in the Norwegian

market was forced. Larvik and Moss must have known that they could end up playing second fiddle domestically if they did not acquire a machine. One could say that they both would be dominated by international manufacturers if they did not cartelise, making one firm damned if they did, and both if they did not.

Cartel Management in the E.V.

Having established the consolidating effects of the E.V. and the Owens machine raises the question of why firms from across Europe would join the cartel in the first place. Joining an institution as comprehensive as the E.V. surely provided benefits, but these were accompanied by disadvantages. Centering on the management of the cartel provides several answers.

Market Differentiation

The original cartel agreement signed in 1907 stated that the members were not to export competitively priced bottles to countries of other members. This declaration supports the idea that the E.V. was engaged with price fixing, as well as geographical restrictions. It is unclear how much of a benefit this protection was to the Norwegian firms however, as import duties already had restricted the import of bottles by close to 90 percent. Even so, it was evident that Moss and Larvik preferred to be in control of bottles provided to the Norwegian market, as shown in correspondence with Gerresheimer during the First World War.

There is little evidence for qualitative differentiation. The different members produced different bottles, supported by several findings. First of all, Moss had to send a prototype to Germany when it

decided to import finished bottles during the First World War, suggesting that Moss produced a type of bottle that the Germans had little experience with. The bottles produced at Gerresheimer being named “gerresheimerflaschen” indicates that this bottle was unique for the German manufacturer. However, it could also be a bottle that originated there, but was produced by other firms instead. This could be interpreted as a form of qualitative differentiation, however, arguments can also be made to the contrary. First, restricting exports made little sense if the firms were meant to supply customers across the cartel. While parts of the export restrictions were state mandated, it is evident that export restrictions were implemented deliberately in the cartel agreement from 1907. The firms having different types of bottles is alternatively supporting the argument of local variations in the market, meaning that Norwegian breweries and German ones differed in bottle preferences.

The Patent Pool

If both geographical and qualitative differentiation are unable to provide good justifications for stability in the glass container industry, can the case be made for patent pool management instead? First of all, the cartel itself was formed to acquire a group of patents. The German bottle association wanted to keep the patent for the Owens machine for themselves, but ended up forming a cartel instead which included firms from other European countries. The reason for this decision is hard to pinpoint exactly.

It could be due to the large initial price of the licence, as forming a larger cartel would provide a larger group with more funds for acquisition. What weakens this argument is that even though two

relatively large groups of firms, that being the French and Belgian, did not join, the cartel was still able to secure the licence. This suggests that it had more than *just enough* capital at hand.

A second possibility is that including a larger number of firms enabled the cartel to control a larger market share. Duties made exports to Norway expensive, so by allowing Moss and Larvik to join, the cartel could effectively regulate a market that was blocked off. Another benefit of firms being members of a cartel is that they cannot form a second one to compete. The Owens machine was the first fully automatic machine to enter the European industry, but others followed.¹⁶² It is reasonable to expect that if a large enough number of firms were prevented from accessing the Owens licence, they would simply form a competing cartel with rights to a different machine. By allowing membership to many firms, the E.V. could ensure better stability and prevent exports to Germany.

Stability During the First World War

The First World War became an obstacle for most international business relations.¹⁶³ This was no different for the E.V. The meeting in The Hague in 1916 should therefore be emphasised. Both German and British officials were aware of the agreement, which is noteworthy due to them being enemies.¹⁶⁴ Even if the British Association broke with the E.V., they still relied on the Owens patent, and the way ahead had to be clarified. Compared to other sectors, like aluminium, where the German

¹⁶² See Wu 2019, Cable 1999 as well as Miller & Sullivan 1984.

¹⁶³ Cox, H. (1997) The Evolution of International Business Enterprise. In John et al. (ed). *Global Business Strategy* (p. 9-46) Cengage Learning EMEA, p. 16.

¹⁶⁴ Biram 1958, p. 35N - 37N.

VAW was cut off from the cartel, the consequences of the war became relatively small for the E.V., where both sides retained access to their patents.¹⁶⁵ The British Association never joined the E.V. again, even after the war was over, making this a permanent division of the cartel.

The cartel was not suspended during the war. The correspondence between Gerresheimer, the E.V. and the Norwegian manufacturers supports this. This differs from the aluminium cartel.¹⁶⁶ That being said, the E.V. was certainly not unaffected, which correspondence as well as the British coal embargo discussed in chapter four highlights. There are other explanations for why the cartel could continue operation. Britain was the only Entente power in the cartel, and it is conceivable that stability would have been affected more if France had been a member too. Apart from Germany and Austria-Hungary, all remaining members were neutral during the war.

The Importance of Quotas

The introduction hypothesised that the mandated quotas were of little importance to the Norwegian firms, however the source material contradicts this partially. What Moss' opinion of these quotas was is not specified, but Larvik's opinions are. It is never stated that its reasons for wanting larger quotas was that it wished to acquire an Owens machine, it is as a matter of fact not stated that they believe the quotas are too low explicitly. However, the comment on quota restrictions in 1916 in light of it not having a machine at the time, and the promise that it would receive

¹⁶⁵ Storli 2010, p. 78. Agreements between businesses divided by the First World War did take place however. The British American Tobacco (BAT) negotiated a sale of their German factory to Deutsche Bank as an example (Cox 1997, p. 16-7).

¹⁶⁶ Storli 2010, p. 77.

the next Norwegian machine makes it a reasonable assumption.¹⁶⁷ It also suggests that the Norwegians were restricted by the quota they had received, meaning that it was significant, even if they considered the trade-off favourable.

Vehicles of History

Moss Glassverk illustrates how a relatively insignificant entity can become a vehicle for an important narrative. The firm found itself in the midst of rapid changes, and its establishment was arguably a result of these. It was founded partly due to changing import regulation, being a Norwegian extension of a Swedish firm with Norwegian owners. Its establishment highlights the disruptive potential of government regulation, and also the creative ingenuity required to manoeuvre around them.

The patent acquisitions in the early 1900s through the E.V. exemplifies, and to some extent explains, consolidation, innovation and the close relationship between the two. The patent pool management solution combined them in a way that enabled a selected few to command a large industry spanning much of the world. On display are also the large consequences modernisation could have, as it transformed the Norwegian bottle industry in a short span of time.

Further Research

While the thesis has examined some of the questions related to consolidation within the glass bottle industry, there are several more to be

¹⁶⁷ Moss Glassverk A/S (1912-1998). Larvik to the E.V., October 19, 1916. Hammer 1931, p. 93.

asked, which the research has unearthed. The character of Johan Jørgensen represents foreign investment in a time when consolidation ran rampant, and his vision and business could be delved much deeper into than what has been possible here. Jørgensen bought several firms in two different countries, and forced them to cooperate. What his vision was, and whether this approach was typical for the time could certainly be looked at more closely.

Patent pool management, or management through intellectual property is intriguing for several reasons. First, the method resulted in rapid adoption of the Owens machine in Europe, making it possible to have had the same effect on other innovations at the time. Second, the rise of Hartford Empire was significant. Did similar patent pools spawn in other industries? If they did not, what factors allowed for this to happen?

Final Remarks

When I was first introduced to Moss Glassverk and the E.V. during the spring of 2021, I would not have been able to fully comprehend the complexity of both their structures and relationship. What initially seemed to be a quirky relative to the modern drug cartels ended up providing insight on several academic fields and a period of time when large scale experimentation on economic structure took place. It is evident when looking back that private and public institutions affect each other significantly, and the end of Moss Glassverk is a perfect example. The company formed to circumvent domestic protection policies found themselves in the late 1990s overwhelmed by foreign competition, forcing operations to cease entirely.

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