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The Decline and Fall of the European Film Industry: Sunk Costs, Market Size and Market Structure, 1890-1927

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The Decline and Fall of the European Film Industry: Sunk Costs, Market Size and Market Structure, 1890-1927

Gerben Bakker[1]

Abstract

In the 1900s, the European film industry exported throughout the world, at times supplying half the US market. By 1920, however, European films had virtually disappeared from America, and had become marginal in Europe. Theory on sunk costs and market structure suggests that an escalation of sunk costs during a rapid US growth phase resulted in increased concentration; eight surviving companies dominated international film production and distribution forever after. European film companies, although overall profitable, could not take part, and after the war could not catch up. US, British and French time series data for 1890-1930 support the theory.

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> You can take Hollywood for granted like I did, or you can dismiss it with the contempt we reserve for what we don't understand. It can be understood too, but only dimly and in flashes. Not half a dozen men have ever been able to keep the whole equation of pictures in their heads.
> F. Scott Fitzgerald, *The Last Tycoon*

1. Introduction

Before the First World War, European film companies produced the great majority of films shown in Europe. In some years, they also supplied most of the films shown in the US. Innovations such as the newsreel and the feature film had their origins in Europe, but realised their largest profits on the American market. After the war, the situation was the reverse: the emerging Hollywood studios now supplied the majority of films shown in Europe. Only a few European films were distributed in the US. This situation has lasted until the present day. Never since have European film producers or distributors managed to obtain a lasting presence in the US.

This remarkable transformation from economic dominance to insignificance during the space of just a few years is the topic of this paper. It will examine what may have caused the collective downfall of the European film companies during such a brief period. To answer this question, the paper will draw on industrial organisation theory, most notably the work of John Sutton on sunk cost, technology and market structure.[2] The hypothesis examined here is that, as market size grew, some film companies escalated their outlays on film production costs. As these sunk costs increased, market size mattered more and European film companies found themselves increasingly at a disadvantage.

Economists often implicitly assume that the film industry has always been concentrated in Hollywood, or at best take the shift for granted. Their focus is on explaining why the international film industry is presently located in Hollywood,

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[2] Sutton, *Sunk Costs*; ---, *Technology*.

quoting increasing returns and network externalities, often exclusively focusing on geographical rather than industrial concentration.[3] This paper takes a dynamic approach by examining the film industry in the one period in which American film companies did *not* control their home and world markets and studying the subsequent change. Both the reasons for the shift itself during the 1910s and for the irreversibility are examined.

The research is worthwhile because few industries experienced such an extreme shift in both industrial and geographical concentration. The research can also give further insight into the theory on sunk costs and market structure, by adding a specific case. Finally, although the entertainment industry was an important new industry that combined technological advance with innovative content, it has been little examined by economic historians.[4]

Analysis of the American market will therefore be the main object of this paper; it was the largest film market and eventually became the world's film production and distribution centre. Moreover, the shift was sharpest in the U.S., where the European market share fell from about sixty percent to a marginal level. Two countries have been selected to represent the European market: Britain, because it was the world's second largest entertainment market and culturally close to the US; France because it was the world's largest or second-largest film exporter before the 1920s, despite its limited home market, and it was culturally more distant from the US.

The period examined starts in the early 1890s when cinema technology was first introduced, and ends in 1927. The sound technology that became widely adopted afterwards was a new, more exogenous increase in sunk cost, which happened after the decline of the European film industry. For the same reason, government protection, which started shortly before sound, will be disregarded. Data on market size, market structure and sunk costs will be examined to explore

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[3] See the next section.

[4] An exception is Sedgwick and Pokorny's work, for example "Risk Environment."

the above theory, combined with evidence from other sources. Since complete and wholly reliable data are lacking for the early film industry, this article aims to do no more than to show convincingly that sunk costs can explain the decline of the European film industry better than alternative explanations. Limitations of the data prevent the making of any stronger claim.

The article will first describe what happened during the 1910s when the European film industry started its decline, and which explanations have been put forward. Then, theory on sunk costs will be discussed and used to analyse the increase in film production costs taking place in the American market during the 1910s. The subsequent section analyses time series data on market structure and the last section explains why the European film industry could not catch up after its decline.

2. The puzzle

In the 1900s the European film industry was in good shape. European film companies pioneered both technological innovations such as projection, colour processes and sound films, and content innovations such as the weekly newsreel, the cartoon, the serial and the feature film. They held by far the largest market share in European home markets, and also a large share of the US market, which at times reached sixty percent. The French film companies were quick in setting up foreign production and distribution subsidiaries in European countries and the US, and dominated international film distribution before the mid-1910s. The pioneer, Méliès and the three largest French companies—Pathé, Gaumont and Éclair—all set up US production subsidiaries. The Danish film industry was also important: the large Danish Nordisk company pioneered films crafted like theatre plays, the predecessors of the feature film.[5] A number of smaller Italian companies were also very important. In the early 1910s, they introduced the long historical spectacle films in Europe and America, also predecessors to the feature film.

By the early 1920s, all this had changed. The European film industry only held a marginal share of the US market, and a small share of its home markets. Most large European companies sold their foreign subsidiaries and exited from film production at home, while the emerging Hollywood studios brought into place their foreign distribution networks. The main puzzle of this paper is how this could happen.

In figure 1, the evolution of market shares in the US and European markets is mapped. The large market share of European companies in the US is clearly noticeable. From 1895 onwards, as they adopted the Lumière technology, their share increased sharply, until it reached about fifty percent of released negatives in 1903, where it stayed until 1910, after which it dropped substantially to roughly twenty percent, and remained so until the war. The rise coincided with the formation of the Motion Picture Patents Company (MPPC), a trust led by Edison to dominate

[5] Mottram, "Great Northern."

the US film market. This tried to monopolize distribution by forming the General Film Company (GFC), which forced exchanges to sell out or lose their license.[6] Of the eight members, only one, Pathé, was European. Other European companies had to supply through trust members or through the independent companies, which soon emerged to defy the trust. By 1912, the power of the trust had declined significantly, as it was not able to eliminate the independents, and the US Department of Justice had started prosecution for violation of the Sherman Act, eventually leading to the liquidation of the trust.[7]

During the First World War, the European market share made a final fall, to about five percent, and has not bounced back since. Measured in absolute terms, the European footage released was the same in 1919 as in 1914, but the US market had grown so rapidly, that what constituted still a substantial share in 1914 amounted to only a marginal part five years later.[8] The fact that the European film industry declined because of marginalisation and not because of some absolute fall in production, is important for the theory put forward in the next section.

[6] In early 1916, when the near-monopoly of the GFC was totally finished and the organisation became more marginal by the day, it was calculated that the average return on its preferred stock was 13 percent, between the issue in 1910 and 1916. Paul H. Davis, "Investing in the movies," *Photoplay Magazine*, February 1916, pp. 71-73, 164.

[7] Cassady, "Monopoly."

[8] Bakker, "America's Master."

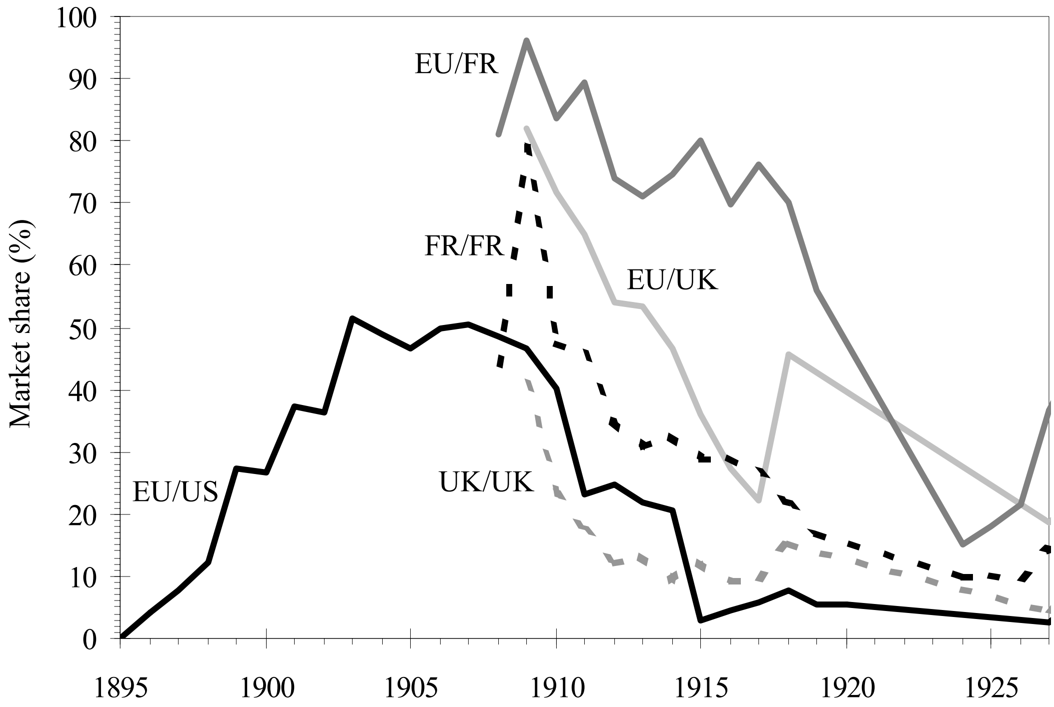

Figure 1. Market shares by national film industries, US, Britain, France, 1893-1930.

Note: EU/US is the share of European companies on the US market, EU/UK is the share of European companies on the British market, and so on.
Source: see Appendix.

The British and French industries' shares of their home markets decrease roughly according to the same pattern as the decrease of the European market share in the US, albeit that the level of the French domestic market share is higher than the British one and fluctuates more. The fact that the direction of changes in all three markets is broadly similar suggests that film technology integrated national entertainment markets, by automating entertainment, standardising it and making it tradable. This market integration had an important impact on the value of the escalation parameter discussed in the subsequent sections.

The question is how the European market share could drop so substantially and so permanently. And why did the situation remain roughly the same ever since the 1910s? Several scholars have mentioned the First World War as a cause, which, by reducing the European home markets, deprived European companies of necessary revenues.[9] A problem of timing exists, because the European market share in the US had already started to fall around 1910 (figure 1). Nevertheless, it could be argued that without the war, the shift would not have been so extreme and an intermediate situation could have emerged.

Little proof exists of a sharp decline of the European home markets consistently throughout the war. Although the market fluctuated, and especially in the first war year declined in many countries because of temporary cinema closures, in other war years demand for entertainment boomed, as filmed entertainment used little raw materials and personnel, yet provided consumers with several hours of consumption and escape from the daily misery. Available statistics do not indicate a fall over-all throughout the war, but sharp fluctuations, and on average a modest to substantial growth in real expenditure.[10] In France, for example, entertainment expenditure fell from 1914 to 1915, because of a temporary shut-down of cinemas and theatres, and the stagnation of film production until early 1915.[11] In 1915, however, entertainment expenditure started to rise sharply, lasting until 1922. While by 1919, live entertainment revenue had merely recovered to pre-war level, cinema revenue was 2.5 times 1914 revenue and accounted for nearly all growth in total expenditure on entertainment.[12]

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[9] An explanation put forward by film historians, such as Thompson, *Exporting Entertainment*; Uricchio, "First World War."

[10] See market size, Appendix.

[11] Abel, *French Cinema*, pp. 9-10.

[12] See Appendix. Total released negative length showed strong growth between 1909 and 1914, but then fell until 1917, while official figures showed consumer expenditure increased substantially. Many more copies must have been printed of fewer negatives. This suggests that an increase in released length in the late 1910s substantially underrepresents market growth. US growth during these years—where contrary to Europe, released length kept increasing all the time—points towards a phenomenal expansion of the market.

Also, the continuity of Europe's large film companies was often not threatened, as the government needed them for propaganda, and their hardware subsidiaries often produced war materials, such as bomb fuses. The three biggest French film companies were even prosecuted after the war for having benefited from excess war profits. Some French companies, and also the Danish Nordisk company, which aggressively expanded in Germany during the war, must have made substantial profits during the war. One would also expect the film industry of neutral countries to boom, if the war was the main cause, but this seems not to have been the case. In Sweden for example, the American market share grew substantially faster than in the allied countries, steadily increasing from five percent in 1913 to 81 percent by 1919.[13]

That the European film industry, though obviously being seriously hampered by the war, did not totally stagnate during war is also supported by information on the number of feature films produced. Feature films were a new product, which became the 'standard', the main product of the film market between 1915 and 1917. While European companies could hardly make the expensive dramas their US counterparts were turning out, the war did not stop them from making these new products and substantially increasing output (measured in numbers of films) during the war (see figure 2). The growth of British feature film production from 1912 onwards showed roughly the same trend as in the US, but with a lag of about one year. The onset of the war lengthened the lag, and only from 1917 did the trend in numbers produced decrease and start to have a different growth shape from that in the US. The growth of French film production, on the other hand, seems to have preceded somewhat the growth of US production and showed a similar direction. The growth path also changed during the war.

[13] Bjork, "Backbone."

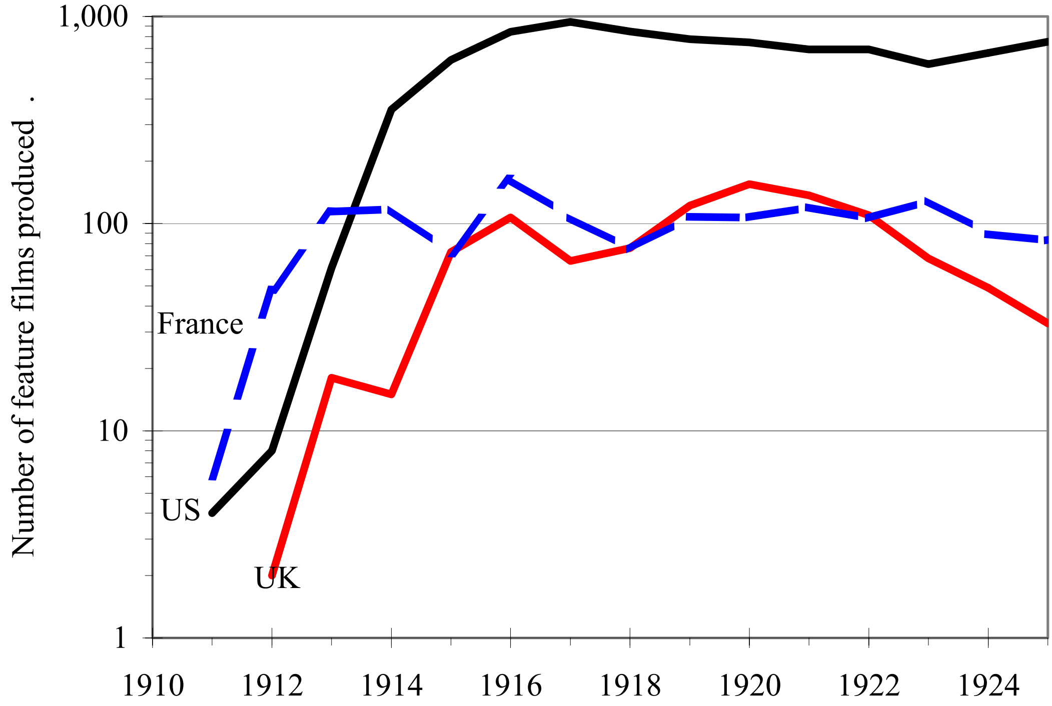

Figure 2. Number of feature films produced in Britain, France and the United States, 1911-1925; semi-logarithmic scale.

Note: for France before 1919, feature films are the films in Globe, *World Film Index*, of 800 meters or longer. In all other cases, feature films are those films considered feature films by the American Film Institute, the British Film Institute, and Raymond Chirat. Generally, this means that films of three reels (c. 3,000 feet) or larger are considered feature films.
Source: American Film Institute Catalogue; British Film Institute; *Screen Digest*; Globe, *World Film Index*, Chirat, *Longue métrage*.

These figures clearly show that although the war probably fundamentally hampered the European film industry in taking part in a new *growth* phase of the film industry, in which the expensive feature film became the main standard, on the other hand, the European film industry did not totally stagnate or incur enormous losses during the war. In other words, in absolute terms, the European film industry probably kept growing, at least moderately, during the war, while in relative terms, its share of the world market was becoming smaller and smaller.[14]

Scholars have also argued that the First World War cut European companies off from their overseas export markets and that the loss of these revenues made them suffer. However, films were small in volume and weight, and only a small number needed to be exported to individual markets. The complications of the war therefore do not seem insurmountable for overseas film trade.[15] Further, industry data from the 1920s and 1930s show that the non-US, non-European markets constituted at the very most ten percent of the world film market, a share which could hardly have been more before the 1920s.[16] Such a percentage does not seem to make those markets essential. Further, records of Pathé, the largest French film company, show that its non-US, non-European subsidiaries continued trading throughout the war and that its Singapore office even made its largest profits ever during the war.[17] This all suggests that the loss of overseas export markets was a consequence of the decline of the European film industry, not a cause.

Another explanation for the decline of the European film industry could be that in the early 1910s a substantial shift took place in American taste away from foreign films, which caused European companies to lose the essential revenues from the US market. Studying the attitudes of the American film business towards the films of the French Pathé Frères, Richard Abel sees an emergence of a feeling against foreign film.[18] Gaumont, a French competitor of Pathé faced similar problems. In January 1914, its US manager asked Gaumont to make an effort to send him very good films, writing "There is as you know, quite some feeling against

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[14] Gomery and Staiger, "The History of World Cinema," are also sceptical about the war as the explanation for the European film industry's decline.
[15] Uricchio, "First World War."
[16] Seabury, *Public*.
[17] Bakker, "America's Master."
[18] Abel, *Red Rooster*, p. 136.

foreign film, and I am anxious to give them our very best to start with,"[19] and later "The General Film exchanges claim that they cannot get their money out of foreign film, and that their shelves are filled with foreign film which has not earned fifty cents on the dollar. As a result, the amount of film sold through Méliès had decreased rather than increased."[20] The manager noted that the taste of American consumers was rapidly shifting away from the multitude of short films of different formats towards longer, dramatic feature films. "The trade in this country is in a somewhat tumultuous condition, big features and features of a sensational nature being the only productions now in demand."[21]

Nevertheless, since arguably audience tastes always change, what mattered was the *capacity* to adapt, and European companies had no lack of that. Méliès had produced films in the US since 1902 under the name Star Films. Gaumont briefly produced films in the US in 1908 and re-started production in 1914. Pathé started US production in 1910. The Danish Nordisk film company, which exported to the US, but also had Eastern Europe and Russia as a major market, made happy endings for the west and filmed sad, dramatic endings for the east.[22]

Several economists have addressed the workings of the international film industry.[23] Most seek to explain why film production and distribution is concentrated in Hollywood, implicitly assuming that this situation has always prevailed, ignoring the dynamics of the problem, and focusing exclusively on geographical concentration rather than industrial concentration. Their work generally talks about network externalities and market size. Storper, who examined the Hollywood film industry since the 1950s, emphasises agglomeration effects and network externalities. Krugman and others stress market size as the reason for US

[19] Collection Léo Gaumont [hereafter CLG], Letter B.T. Bradford to Charles Gaumont, 19 January 1914, Box Gaumont-USA [hereafter BGU].
[20] CLG, Letter B.T. Bradford to Charles Gaumont, 14 July 1914, BGU.
[21] CLG, Letter B.T. Bradford to Charles Gaumont, 17 February 1914, BGU.
[22] Bronlow and Gill, "The Other Hollywood;" Mottram, "Great Northern."
[23] The problem is sometimes formulated as "The iron law of Hollywood dominance". See for example Storper, "Transit"; Andersen, "Iron Law"; Noam, *Television*; and even the textbook Krugman and Obstfeld, *International Economics*, p. 152.

dominance in the film industry. These claims are certainly not incompatible with this paper, but cannot explain the dynamics of the situation, of Hollywood's rise to dominance. They do play a role in the European film industry's failure to catch up, and will be discussed later. Some scholars have also applied Chandler's idea of the modern, multi-divisional business enterprise to the film industry, claiming that since Hollywood studios made the threefold investments in production, distribution and management, the Hollywood companies eventually dominated the international film industry.[24] Since European companies, especially French ones, were doing the same in the late 1900s, this cannot fully explain the eventual success of the Hollywood studios.

[24] For example Bordwell e.a., *Classical Hollywood*.

3. Theory

Sunk costs generally are considered to be those costs which cannot be avoided when a firm enters an industry, which cannot be recovered when it exits and which are not incurred periodically.[25] While exogenous sunk costs are dictated by technology and are roughly the same for every firm in the industry, the level of endogenous sunk costs (such as advertising or research and development (R&D)) can be decided upon by each firm. John Sutton showed that in industries with high endogenous sunk costs, concentration does not necessarily fall as market size increases. In order to reach robust implications that hold across industries, Sutton identified a lower bound to concentration as a function of the size of the market.[26] This bounds approach gives levels (at given market sizes) below which concentration will not fall, but does not make a prediction of the exact level of concentration, as the latter can be influenced by numerous historical factors, like first mover advantages, collusion, institutional factors.

In these endogenous sunk costs industries, a size of the market exists which is large enough for firms to start an escalation of spending on endogenous sunk costs. This escalation, however, only becomes profitable when market size reaches a certain level. For low values of set-up costs, this means that industry is fragmented for low size, but after a switch point there is escalation of outlays on endogenous sunk costs. When a jump in endogenous sunk costs occurs, escalating costs imply that fewer firms will survive. As sunk costs increase, the set-up cost becomes irrelevant.

An increase in sunk costs of an individual company, which might not be justified by the resulting increased share of the existing market, might be recouped by the same share of the increased market. The occurrence of escalation strategies depends on the effect of an increase in sunk costs on an increase in market share.

[25] Fixed costs, on the other hand, are often incurred periodically, often are avoidable and often can be recovered upon exit (for example real estate, general purpose machines).
[26] Sutton, *Sunk Costs*; ---, *Technology*.

This effect tends to be high in many advertising-intensive and some R&D-intensive industries, in which strong incentives to escalate advertising or R&D costs can emerge as market size increases, making entry more difficult and leading to a lower bound in concentration as the market grows to infinity.[27]

The film industry has three important characteristics with respect to Sutton's model. First, outlays on film production can be regarded as sunk costs,[28] since all the cost of making the film negative has been incurred before copies can be made and rented to exhibitors. Second, costs sunk in film production are mainly endogenous, as the minimum production cost of a film is extremely low, negligible compared to market size. Third, film production has a strong R&D character because costs are incurred once, the film can be sold/rented internationally, and the film is protected against imitation by copyright law. Film production and distribution also have an advertising character because several production factors—mainly the film stars and the literary work on which the film is based—have a function similar to that of brand names in advertising-intensive industries.[29] The popularity of these "brand names" can be influenced nationally by advertising of the film and its stars, which is part of the film distribution business.

For R&D-intensive industries, Sutton characterises the possibility for a profitable jump in sunk costs by the 'escalation parameter' alpha. This takes the ex-post profits of the escalating company as proportion of ex-ante industry sales, divided by the size of the escalation of sunk costs (measured as sunk costs of the escalator as a proportion of ex ante average sunk costs in the industry).[30] The value

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[27] Ibid.

[28] Some production factors can be considered sunk costs independent of individual films; for example rights to literary properties (usually only part of acquired copyrights is used), or star contracts (seven year contracts became common in this period).

[29] Sutton, *Sunk Costs*; ---, *Technology*; Bakker, "Stars and Stories."

[30] Formally:

$$\alpha_{1,2} = \frac{\pi_2}{Y_1 \bullet K_2}$$

of this parameter will determine whether an escalation strategy would be profitable. The value of alpha will partially depend upon how much an increase in outlays along a certain technological trajectory will also catch sales from the markets of other technological trajectories. In an industry with few 'spill-overs', in which the technological trajectories are quite separate, escalation will not be profitable. Sutton studied the flow meter industry as an example of such an industry. This 'spill-over effect' may be partially measured by the degree to which the market of a certain industry is homogenous. To this purpose, Sutton uses an index of homogeneity which measures the sales of the most popular product type/category as percentage of total industry sales. It follows then that in an industry with a high degree of homogeneity, escalation is likely to be profitable for a certain size of the market.

In the film industry, film production outlays (which have an R&D character) and advertising and promotion outlays can be considered endogenous sunk costs: they must be made to enter the market, cannot be recovered once incurred, and their level can be chosen by the firm: they can be very minimal or very large. Outlays on studios can be considered endogenous set-up costs: they have to be made to enter the market, but they will have substantial residual value if the firm exits, such as the value of real estate, buildings, laboratory, props or stocks. Similarly, the set-up costs of a distribution network are exogenous and fixed: costs of national networks are roughly the same for every company and have residual value (the offices). The operating costs of a distribution network are largely fixed, but partially variable, dependent on the throughput of the network.

While Sutton studied relatively mature industries, this paper examines an emerging industry with both a strong technological character (the film technology) and content character (the films themselves). Initially, it was far from clear what exactly the product and the market were and what they would look like in a few

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With subscripts 1 and 2 denoting periods before and after escalation, π_2 the escalator's profit, Y industry sales, and K the size of the outlays, measured in the number of times the average ex ante industry outlays.

years time.[31] Moreover, many parameters that are givens in Sutton's industry studies, change over time in the case of the emerging film industry. The index of homogeneity for example, increased sharply over time, and the escalation parameter alpha was partially endogenously determined.[32]

The three characteristics above suggest that theory on sunk costs could be used to account for the decline of the European film industry. It is expected that initially, when market size was still limited, the relationship between concentration and market size followed the 'traditional' pattern, with the lower bound to concentration decreasing as the market grows. At some point, when market size increased rapidly and sunk costs were escalated,[33] in a jump rather than a gradual increase, the previous relationship between market size and concentration broke down: concentration would not fall further, but was bounded from below and did not approach zero as market size converged to infinity.

The literature discusses qualitatively how the feature film became the standard during the mid-1910s.[34] Before, a cinema-visit meant seeing a succession of many different films each lasting between one and fifteen minutes, of many different genres such as cartoons, newsreels, comedies, travelogues, sports films, 'gymnastics' movies and dramas. After, going to the cinema meant watching a feature film, a heavily promoted dramatic film with the length of a theatre play based on a famous story and featuring famous stars. Other film types simply became side dishes to this new industry standard. The film history texts also discuss how at the same time film companies spent enormous sums on exclusive contracts with famous stars, on rights to novels and theatre plays and on special effects and extravagant sets and scenery.[35] It is expected then, that the escalation phase

[31] A situation not wholly unlike the early days of internet.
[32] See below.
[33] Actually, this should be market size over set-up costs (S/σ), but since σ is negligible, market size is taken. Sutton observes that, when market size has grown enough to make escalation feasible, a small increase in sunk costs will not be profitable, but that a large increase will be. Sutton, *Sunk Costs*, chapter 3.
[34] For example Cook, *History*.
[35] The increase in film production costs is analysed in Bakker, "Stars and Stories."

coincided with the advent of the feature film, and that an increase in sunk costs, market size and concentration will be observed.

4. The mechanics of the escalation phase

This section will first look at how sunk costs increased, and on what specific items the outlays were spent. Then it will investigate how firms discovered that escalation of film production costs could be profitable, in other words, how they discovered that the film industry was changing into a high-alpha industry. Last, it will look at the strategies of several firms and evaluate to what extent they were deliberate.

4.1 The increase in sunk costs

Specific data on sunk costs in the early US film industry are sparse. From the mid-1900s, film production costs rose gradually. In 1909, they were between 550 and 1,100 dollars.[36] Films were sold by the foot, and differences between production costs of films were moderate. Film lengths were short, and in the early 1910s, they converged to a standard of about 1,000 feet, which equalled one reel (about fifteen minutes). After 1911, one reelers were sometimes varied with two-reelers. Then, during the 1910s, roughly between 1913 and 1918, some companies sharply increased their outlays on film production, making 'feature films', longer films with the length approaching that of a theatre play (initially mostly 3-5 reels, later more), based on a famous story and featuring famous players. "Famous players in famous plays," as Paramount, a first mover, would advertise them.

The question then is, how exactly the increase in outlays on sunk costs took place. Costs increased across five paths: outlays on individual films, on portfolios of films, on sales promotion, on R&D-capacity (studio-complexes), and on national distribution networks. The first three are sunk costs, the last two mainly fixed costs.[37] The companies that started escalation of sunk costs, basically embraced all five components, although the latter two, especially distribution, initially were

[36] All figures in 1927 dollars. Allen, *Vaudeville*, p. 219; Hampton, *History*, p. 211.
[37] The last two have a residual value and their operating costs are incurred periodically and can be avoided.

accomplished done through long-term contracts rather than bringing the activity inside the firm.

The increase in outlays on films and film portfolios could take place in four ways: increases in the quantity of inputs used, in input prices, in set-up costs, and in larger unit sizes (longer films). The last reason only mattered to a certain, restricted degree; even if corrected for the increase in length, feature films were several times more expensive than other films. Increase in input quantities reflected the need for more specialists, such as several cameramen instead of one, lighting experts, make up artists, writers, more extras for mass-scenes, more actors, the need for special sets, more materials, and more special effects inputs. Also, the quantity of advertising was sharply increased. Increases in input prices consisted of a sharp increases in players' pay, increases in directors' pay, but also more moderate but substantial increases in the pay of the highly specialised technical craftsmen. Set up costs increased because of the need for large studio complexes and nation-wide distributing organisations.

Although information on the exact breakdown of film production costs is more difficult to trace than are data on total costs, available figures suggest that by the 1920s and 1930s, a large part of the total film budget was spent on creative inputs. The total share of the budget spent on players, the director and the story was on average about 30-40 percent, and for high budget films even higher. The creative inputs were human capital in the most literal sense of the word. By the 1920s the major studios had their stars under long-term contract and could partially capture their rents, giving them a return on their investment. Sparse data for Britain and France suggest that in those countries, outlays on creative inputs were 20-30 percent, while film budgets were substantially smaller, which suggests that a large part of the increase in American film budgets was due to outlays on (intangible items as) creative inputs.[38] This was also noticed by industry observer and investor

[38] Bakker, "Stars."

Benjamin B. Hampton when he discussed the increase in film production costs during the 1910s.

> The matter of wage increase was bound up with an indefinable demand for better and better pictures that seemed to have no ending. Better stories were wanted, and this meant more money for plays, novels and continuities and scenarios. Better sets, better dressing of stages and more expensive costumes; fewer pictures per star unit per year. In every section of production, manufacturers could see expenses mounting higher and higher. Negatives that had been costing $10,000 to $30,000 were now requiring outlays of $30,000 to $75,000, rising to $100,000 or $125,000 if they included first-rank stars.
>
> Most of the established producers and distributors, and the few financiers who had become interested in the industry, did not believe that such expensive pictures could earn a profit. They were convinced that movie commerce had been pushed to the limit in the short time since features came in, and they saw little possibility of extending its boundaries for several years to come.[39]

Besides outlays on inputs, sunk costs were also incurred to perfect the technical quality of films. Although it is difficult to get an insight into the magnitude of this increase, some properties, which can be identified on film negatives, such as the number of shots, set-ups and inter-titles may serve as indicators for the increase in these costs. As shown in figure 3, for selected films of just one company, the American Film Manufacturing Company, the number of different shots per film increased from 14 in 1911 to over 400 by 1918, while the number of set-ups increased from seven to 230, and the number of inter-titles from 5 to 177. If these indicators are averaged and used as a proxy for the 'technical expenditure' on film making, these outlays must have increased over thirty times in real terms between 1911 and 1918. This is probably no more than a lower bound, as pay for the craftsmen probably increased. It reflects the costs necessary to make an average unit size; however, even if the costs increase is corrected for the increase in average unit size (from 0.84 to 4.77 reels), these costs would still have more than quintupled between 1911 and 1918. Nevertheless, one can argue that the average costs per unit are the right measure, as these were the costs that had actually to be incurred by film producers. These data show a somewhat 'objective' measure of the increase in perceived quality that the jump in sunk costs brought about.

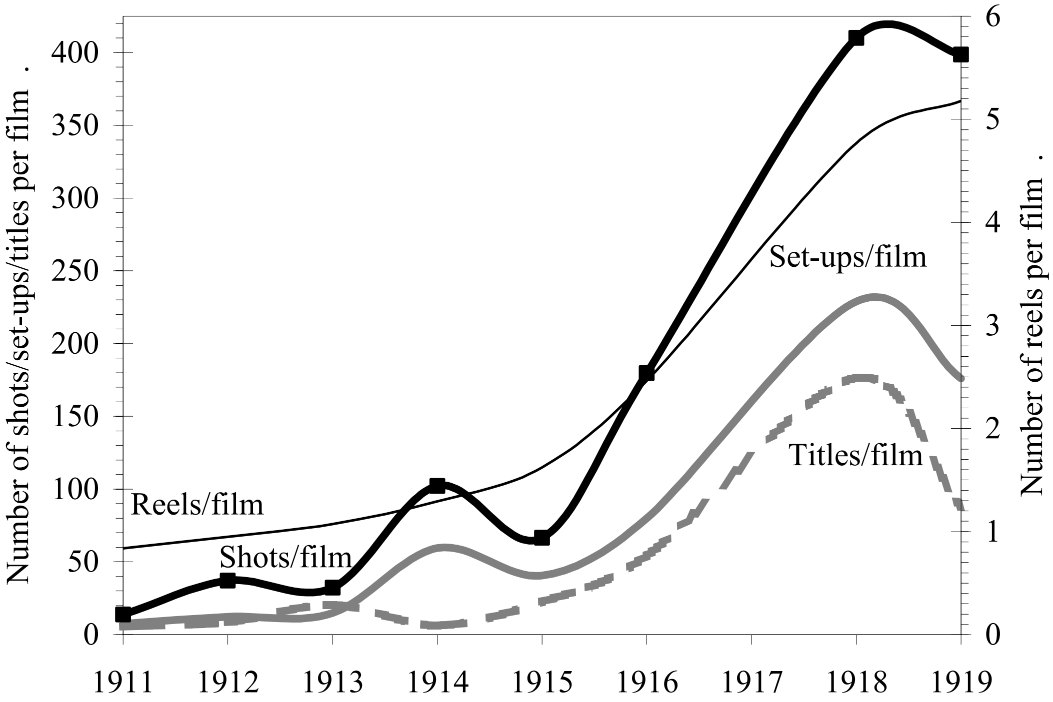

Figure 3. Estimated average number of shots, set-ups and inter-titles per film, American Film Manufacturing Company, 1911-1919.

Note: these series are based on analysis by Lyons of eleven representative films, combined with the company's average film length, and thus give no more than a rough indication.
Source: Lyons, *American Film Manufacturing Company*, pp. 87, 170.

The increases in costs of all these aspects of film making resulted, of course, in a sharp rise in total film production costs. Although systematic data on total film production outlays are scarce, those which are available suggest a sharp increase in film production outlays during the 1910s, coinciding with the point at which the

[39] Hampton, *History*, p. 168.

feature film became the standard format. The real average cost of Fox feature films increased from $13,000 in 1914 to $32,000 in 1917, to $106,000 in 1927, the last year before sound technology became adopted—a sevenfold increase, while gross rentals only doubled.[40] The real average cost of pictures by Cecil B. de Mille, one of Paramount's producers, increased by a factor of eight, from $15,000 in 1913 to $128,000 by 1920.[41] Similarly, Warner Brother's real average production costs increased from $90,000 in 1922 to $168,000 in 1927.[42] Average real production outlays per picture in the industry increased by 38 percent between 1919 and 1921, from $24,000 to $57,000 and grew fourteen percent annually between 1921 and 1927.[43]

Rough indicators of the ratio of film production costs to total ticket sales, the 'R&D-to-sales ratio', are plotted in figure 4a. The figure suggests a sharp increase between the early 1910s and the mid-1920s. The ratio for Paramount, the market leader, was 52 percent in 1919.[44] The industry R&D-to-sales ratio, according to the census data, shows a ratio lying roughly within the same range, but more stable than the individual company data.

[40] Figures in 1913 dollars.
[41] Figures in 1913 dollars.
[42] Koszarski, *Evening's Entertainment*, p. 85; Glancy, "Warner." Between c. 1907 and 1917 cost increases are partially due to the increase in average film length, from ca. 500 feet to about 5000 feet (c. 75 minutes) for feature films.
[43] Census; 1913 dollars.
[44] First six months. "Gilmore," p. 69.

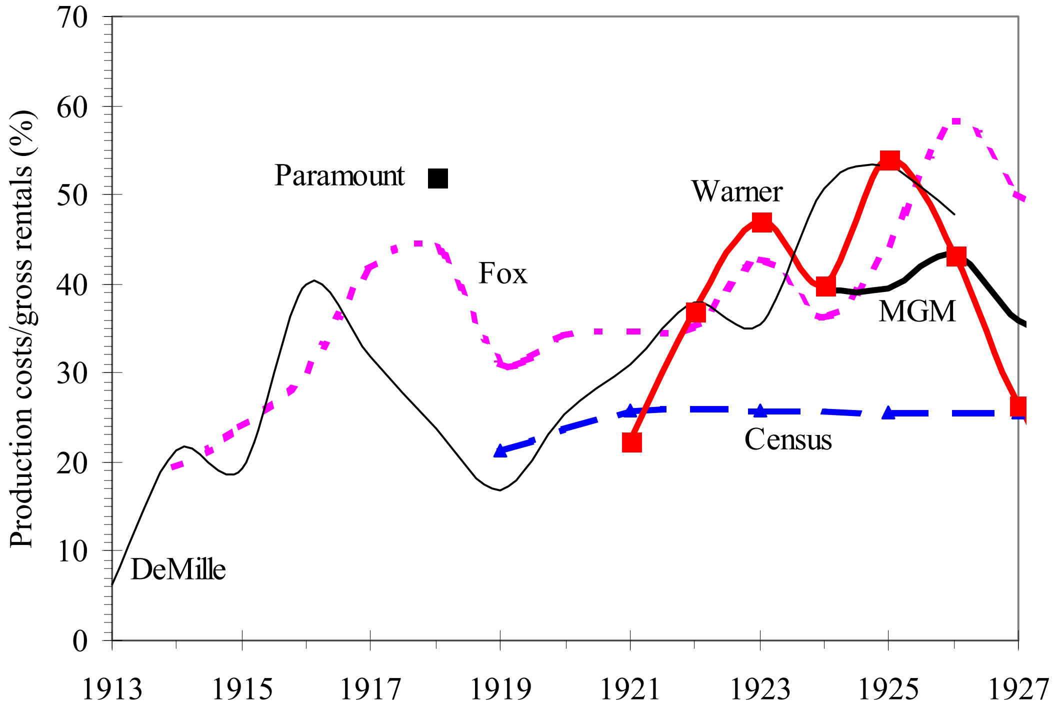

Figure 4a. Annual production costs/gross rentals ratio for various US film companies, 1913-1927.

Notes: DeMille: These do not concern company outlays but are for just one producer of Paramount. The resulting ratio is thus not based on an entire annual portfolio of films, like the other company lines, but on just a few films, generally between one and five, with 1914 and 1915 as exceptions, with 7 and 13 films, respectively. This decreases the comparability of the DeMille line to the other lines but since so few time series data are available, it is nevertheless plotted here.
Census: total industry outlays as a proportion of US box office revenue, not gross rentals (=gross distributors revenue) like the company-lines.
Sources: Census: US Census of Manufacturers, 1919-1931; market size data: see appendix; DeMille: Pierce, "DeMille"; Fox Film Corporation: Koszarski, Evening's Entertainment, p. 85; Metro-Goldwyn-Mayer: Glancy, "MGM"; Paramount: "Gilmore," p. 69; Warner Brothers: Glancy, "Warner."

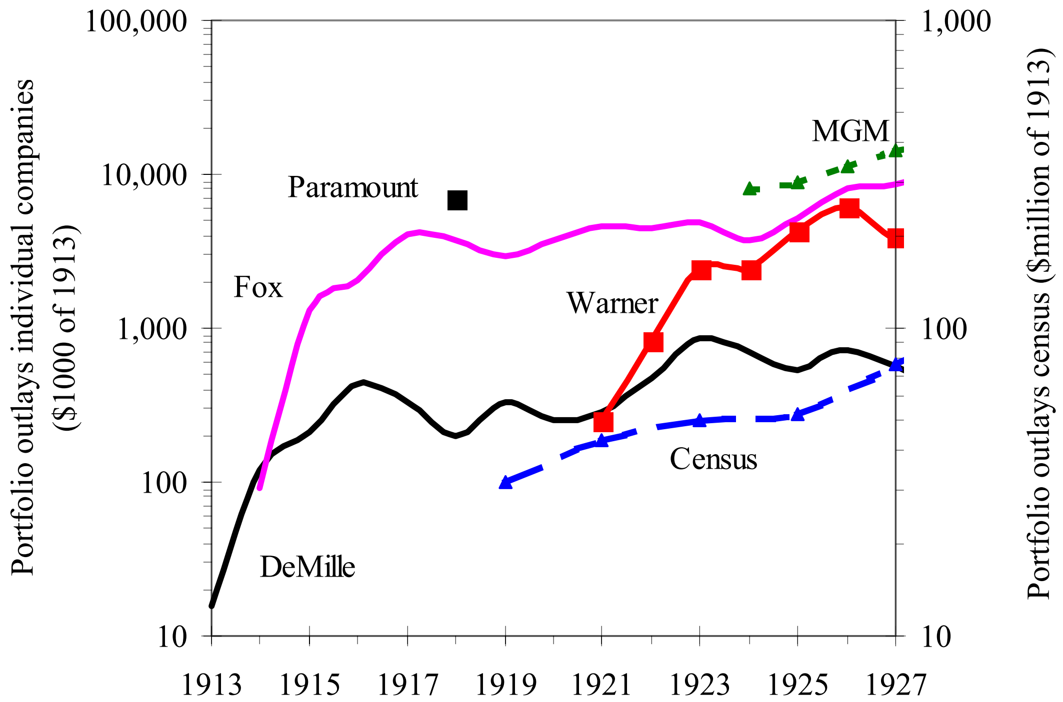

Figure 4b. Total annual production outlays for various US film companies, 1913-1927, in constant (1913) dollars; semi-logarithmic scale.

Source: see Figure 4a.

The rise in real *average* production costs does not reflect the amount of capital that companies which sharply increased their outlays on film production had to find. This would be better reflected in the production outlays on a company's entire portfolio of films.[45] The case of Fox Film Corporation clearly shows that the escalation strategy involved a sharp and extremely risky jump in sunk costs indeed. The real total amount that the company sunk in film production, increased from just \$92,000 in 1914 to \$1.3 million in the next year, two million dollars in 1916 and four million dollars in 1917 (figure 4b). This was indeed a massive multiplication of sunk costs. Although few data are available, similar jumps are likely to have

[45] Sedgwick and Pokorny, "Risk Environment," stress the importance of portfolios of films rather than individual films.

obtained for the other escalators. The film portfolio DeMille had under his management shows a massive increase in cost, from $15,000 in 1913 to $430,000 in 1916. Although this gives no information on the capital sunk into Paramount's total film portfolio, it does suggest a massive expansion, at the very least as large as that of Fox.[46] By 1919, Paramount was spending $3.1 million on film production, and paid another $2.9 million to outside producers during the first half of the year.[47] Total US industry real production outlays increased by 35 percent between 1919 and 1921, from 32 to 42 million dollars, and grew ten percent annually between 1921 and 1927, with annual growth per firm at 8.1 percent. Spending on scenery and stage equipment, mainly endogenous spending categories, increased threefold between 1921 and 1925, a growth of 31.6 percent annually. Expenditure on cameras and projectors, basically exogenous expenditure, increased 63.7 percent from 1921 to 1925, a growth of 13.1 percent annually.[48]

Distribution costs also increased. In the mid-1900s, 125 to 150 independent film exchanges existed, buying films for ten cents a foot and renting them to about 6,000 exhibitors, who charged a five to ten cent admission price.[49] In 1907, for one typical exchange the set-up costs were $12,067.[50] In 1910, the MPPC acquired all 'official' (license-fee paying) film exchanges and merged them into the General Film Company, the first national distribution organisation, and a near-monopoly. In 1914, the French Pathé company founded the first competing national distribution system, with offices in 31 'key-cities', followed by several other companies. In 1919, the operating cost of a national distribution system lay between $520,000 and $780,000 a year, promotion expenditure not included.[51] By 1926, this had risen to

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46 See below.
47 "Gilmore," p. 69.
48 Census.
49 Seabury, *Public*, p. 8.
50 Musser, *Emergence*, p. 436.
51 Hampton, *History*, p. 211.

two million dollars.[52] Film rentals charged to exhibitors grew roughly 3.75 times between fall 1916 and fall 1920.[53]

Effective coordination and the non-excludability or nation-wide character of many forms of advertising eventually made national distribution organisations more cost-effective than the independent regional exchanges. In 1929, the operating cost of the 444 exchanges which were part of national networks was 15.2 percent of business done, while for the 75 independent exchanges it was 35.0 percent.[54] National distributors, encompassing 83.3 percent of all exchanges, handled 94.67 percent of business, while independent exchanges, encompassing 14.1 percent, handled only 2.2 percent.[55]

4.2 The process of discovering the escalation parameter

The question, then, remains how the first movers discovered that a sharp jump in sunk costs would disproportionately increase revenue: how did they discover the true value of alpha? The escalation parameter generally can be increased by a new technology or market integration.[56] In economic terms, the feature film was a change in technology, an innovation, and therefore increased the escalation parameter but this was increased further by a side effect. As a result of the feature film, cinema increasingly became a substitute for live theatrical entertainment and started to integrate the markets for these kinds of entertainment. Many of the lower value-added local entertainments were now replaced by entertainment produced on one location in the nation and distributed nation-wide.

Sutton uses the 'arbitrage principle', the principle that if a profitable opportunity exists in the market, at least one company will fill it. This implies a weak concept of rationality since 'one smart agent' is all that is required to fill the

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[52] Seabury, *Motion Picture Industry*, pp. 4, 198.
[53] "Gilmore," p. 64.
[54] U.S. Bureau of the Census, 1929.
[55] The export exchanges, constituting 2.6 percent of all exchanges, handled 3.1 percent of business, ibid.
[56] Sutton, *Technology*.

gap.[57] Sutton is not interested in exactly how the gap is filled but merely posits its elimination. The key issue here is time, and economic history in this case offers an unique opportunity to get some insights into the dynamics of the situation, and the process by which the profitable opportunity that existed in the film market in the early 1910s was exploited.

From the late 1900s, a process of discovery was at work in which entrepreneurs experimented with different types of film and discovered that some types consistently yielded more revenue than others. In the mid-1900s, Adolph Zukor (later Paramount's president), who owned fourteen Nickelodeons (cinemas with a few hundred seats) in large cities, had problems obtaining films he wanted, and made every effort to search for 'better' pictures. When he exhibited the three reels, hand-coloured *Passion Play* of Pathé (most films were under half a reel at the time), it was an enormous success, bringing in customers for months. Zukor wanted to move further into these bigger pictures. "We stayed on with that picture for months and did a land office business (...) Then it occurred to me that if we could take a novel or a play and put in on the screen, the people would be interested (...) I did approach all the producers then in the business and tried to sell the idea of making big pictures. (...) They were so busy turning out [one and two reel pictures] that they would not undertake anything else. In fact, they did not believe that people would sit through pictures that ran three, four, five reels."[58]

In 1909, Zukor sold all his theatres to Loew's (later part of MGM), and started to study the motion picture industry for three years, travelling, watching many different types of films, and especially adopting the habit of sitting on the first row, not watching the screen but the faces of the audience as they were watching. "In 1911," Zukor recalled, "I made up my mind definitively to take big plays and celebrities of the stage and put them on the screen." In November of that year he advanced $35,000 for a film starring the French actress Sarah Bernhardt. Competitors were surprised Zukor was willing to pay such a large sum. In March

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[57] Sutton, "One smart agent."

1912, Zukor released the picture through the chain of vaudeville theatres Klaw and Erlanger, because the MPPC did not want to allow it a license. However, after initial success, the MPPC gave it a licence and the film grossed about $60,000—not enough to recoup costs but leading Zukor to remark that his first experiment was not too costly. That is exactly how he saw it: as an experiment to test the market. "We did gain the knowledge that made us absolutely certain that pictures of the right type had a great future."[59]

In the early 1910s, other entrepreneurs noted the success of longer Italian films, starting with *The Fall of Troy* and *Dante's Inferno*.[60] The films contained expensive historical sets and mass-scenes, and the films lasted three to four times as long as the standard film, about 45 to 60 minutes.[61] Production costs were high but ticket prices were also higher, and the films became widely popular.[62] In showing these first films, often 'road shows' were used; travelling companies of projectionists, publicity personnel and administrative staff would rent theatres or equivalent buildings in cities and show the film until revenues fell, and then move on to the next city. In New York and Boston *Dante's Inferno* played for two weeks, while the average American MPPC-film only lasted two days. Moreover, it played in rented 1,000-seat theatres, at a price of $1, while American films normally played in two hundred-seat Nickelodeons at 5-10 cents.[63] This discovery that higher costs, length and ticket prices could disproportionately improve profitability showed some smart American producers the way to the feature film.

By the end of 1913, features were becoming more popular in cinemas. Many cinemas showed short films for six days and a feature film for one night, often a Sunday night. The disproportionate popularity with audiences of the feature film is clear from the rental prices; a six days' supply of shorts programmes through one of

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[58] Zukor, "Origin."
[59] Ibid.
[60] Cherchi Usai, "Italy."
[61] This was 3,000-4,000 feet.
[62] Cherchi Usai, "Italy."
[63] Gomery, "Hollywood studio system," p. 46.

the three main shorts distributors (General Film Company, Mutual and Universal, at that time) cost about $45, while top-rated features rented for $50 for a single night, meaning that exhibitors were prepared to pay more for one night than for the whole week, if they got a feature. By the summer of 1914, the smaller cinemas were still showing eight to nine reels of short films for five cents admission, while the newer and bigger houses were showing features for ten to twenty cents.[64]

That the increase in sunk costs did not exclusively make sense while shifting from producing shorts to features, but also to producing expensive, heavily promoted feature films, is illustrated by the calculations of Walter W. Irwin, distribution manager of Vitagraph-Lubin-Selig-Essanay. In 1915, Irwin calculated that a cinema showing average features that changed each day had daily sales of $300 and a margin of 42 percent ($125). Film rental was 8.3 percent of sales ($25), advertising 16.7 percent ($50). If the cinema shifted to a weekly, highly publicized quality film, and doubled expenditure on both film rental and advertising, daily sales would grow to $550, the margin to 54 percent ($300), while film rental and advertising would be 9.1 and 18.2 percent of sales.[65]
Industry veteran Benjamin B. Hampton recalled how in the mid-1910s many cinema-owners discovered the profitability of features. "Owners of theatres, who had been cautiously advancing their admittance rates, learned that their patrons would pay twenty-five cents, or in a few cities as high as thirty-five cents, to see the best pictures; and at these prices the profits were larger than ever before, even though the exhibitor had to pay somewhat higher rentals."[66]

In Europe, the feature film seemed to have a similar revenue generating capacity. Particularly good British evidence, from a somewhat later date than the American data above, actually shows the escalation phase at work at the micro-level and confirms the superior profitability of the feature film. In 1918-1919, Pathé

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[64] Bowser, *Transformation*, pp. 213-214. The length of programme had little to do with higher admission prices; it was the special qualities of the feature, even though it might have been a two or three reel film.
[65] Bakker, "Stars."
[66] Hampton, *History*, p. 164.

Exchange Ltd., a British film distributor, reported revenues of feature films that were 32 percent higher than revenues of all film formats taken together, when measured in revenue *per meter* of film.[67] Since feature films were at least several times longer than other formats, in absolute terms the difference must have been even higher. In the next season, 1919-1920, the gap in revenue between feature films and other films had more than doubled: feature films now yielded 67 percent more revenue per meter than all films taken together.[68] If for the latter season, revenues of feature films are not compared to revenues for all films, but to revenues for all *other* films, revenue per meter for feature films was 2.9 times the revenue for all other films.[69] An advantage of feature films over a popular format such as the newsreel was that revenue did not decline as much each day after release. The rental price of newsreels, for example, halved three days after release, and nine days after release was only a quarter of the initial price, while the number of copies rented had halved on the sixth day after release.[70] These figures lend support to the notion that feature films were disproportionately and increasingly profitable, and that therefore an escalation of outlays on sunk costs on feature film production could be a profitable strategy. It also shows that entrepreneurs certainly found out the

[67] Revenues per meter for feature films were 33 pence, vs. 24 for serials, 29.5 for comics, 15 for pictorials, 9 for newsreels (the Pathé Gazette), and 25 pence for all films, on average. Beaverbrook Papers [hereafter BP], "Report by Hedly M. Smith on the business of Pathé Ltd. for the period 1st December 1919 to 31st May 1920," file H274.

[68] Ibid. The same six month periods for 1918-1919 and 1919-1920 are compared. Revenues per meter for feature films was now about 47.5 pence, vs. 25 for serials, 36 for comics, 19 for pictorials, 8.5 for newsreels, and 28 pence for all films, on average. The decline of the revenue of newsreels was probably due to the end of the war. Total revenue for the six months was £166,994. Despite the high revenue per meter, feature films accounted for only 23 percent of total revenue, vs. 41 percent for serials, 22 percent for newsreels, 9 percent for comics, and 5 percent for pictorials. The large share of serials was probably due to the betting of Charles Pathé on the serial becoming the industry standard, the large share of newsreels was probably due to Pathé's specialisation in that genre and its world-wide network of correspondents. Back in the 1900s, it had been the first company to launch a weekly newsreel.

[69] Unfortunately, the disaggregated profits per meter of film are unavailable. Profit per meter for all films taken together was 3.2 pence in 1918-1919 and 2.3 pence in 1919-1920.

[70] BP, Letter Frank Smith to Lord Beaverbrook, 2 February 1920, p. 3, file H274; BP, letter H.M. Smith to Lord Beaverbrook, 8 October 1924, file H279. The latter letter discusses a change in the pricing structure over time for the Pathé Gazette, and thus also discusses the earlier pricing structure.

profitability of features, and that those in a position most able to do so were the ones active in distribution or exhibition.

The discovery by cinemas that they could sharply increase ticket prices shows the revenue side of the escalation phase at work. Consumers were willing to pay more for a feature because of substitution and income effects. Rising prices combined with increasing demand (and changing perceived quality) generally show a substitution process at work. For film consumption during the rise of the feature film the substitution effect worked in three ways. First, the feature film made cinema look more like theatrical live entertainment and thus it became a better substitute for it. Even the increased cinema prices were often substantially lower than prices for live entertainment. Second, since film partially was a product with wholly new qualities, which could not be found in live entertainment, consumers probably also substituted cinema for expenditure on other items. Third, consumers could substitute watching expensive feature films for watching shorts or cheap features. Since the price of cinema was lower than that of most live entertainment, consumers would also benefit from an income effect, which may have induced them to increase further the number of cinema visits. This all points to a disproportionate reward for producers who took a jump in quality.

Changes in distribution practices formed a vital element in the strategies of the companies that started the increase in sunk costs. The film industry was an industry with large fixed costs and the marginal revenue brought in by the marginal cinemagoers equalled marginal profits to the cinema owner, while for the distributor the marginal revenue brought in by the marginal engagements equalled marginal profits. Initially, when films were sold, and later rented for a flat fee, the producer saw little of these marginal revenues but, during the 1910s, the changes in distribution practices translated ever more of the marginal cinema revenues into producers profits, first by percentage-based producer-distribution contracts, later by similar distributor-cinema contracts. The result was that a producer would actually get part of the additional cinema revenues that an increase in perceived quality of a film generated, thus increasing the value of alpha, giving the producer an incentive to expand outlays on film production, and making escalation profitable. Without these changes in distribution practices, an escalation strategy could hardly have been profitable, as it would be the producer who incurred the costs but the cinema-owners who got the additional marginal revenue, equalling profit. The change also increased the incentive for distributors to rise film advertising outlays until the last dollar spent equalled marginal distributor's profits. So during the escalation phase there was a double effect on producer's revenues: marginal cinema revenues increased sharply because of price increases and capacity utilisation increases, while at the same time producers received more of these marginal cinema revenues.[71]

Hampton underlines the way in which cinemas profited from the unskimmed marginal revenues before the change in distribution practices: "The exhibitors were buying service at prices that made intelligent theater operation extremely profitable; net return of twenty-five to fifty percent per annum on the capital invested in movie houses was assumed to be the prevailing rate, but some theaters ran this up to a hundred percent."[72]

4.3 Firm strategies

This section tries to find out whether the firms followed deliberate strategies when they increased their outlays on film production. The section above already showed that entrepreneurs increasingly became aware of the disproportionate increase in revenue a given increase in production outlays could have. This section is more preoccupied with how they acted on this information, if they then deliberately started to increase sunk costs, how they did it, and how they got hold of the vast amounts of capital needed to embark on such a kind of escalation strategy. The

[71] So it should be emphasized that the changes in the distribution practices did not merely involve producers attracting away profits from cinemas, but they changed the whole incentive structure of the industry and gave producers a larger incentive to spend more on sunk costs.
[72] Hampton, *History*, p. 164.

section will also examine whether any differences existed between winners and losers.

Most of the entrepreneurs who started the escalation of film production costs, began as investors in real estate, and in the early 1900s were pioneers in the Nickelodeons, which they discovered could maximise the return on real estate.[73] This in contrast to the members of the MPPC, which mostly started as manufacturers of equipment and film, and then by necessity had to branch out in producing the films. The fact that these first escalating entrepreneurs were not technology-driven, nor creatively-driven, but basically financially/real-estate-driven, was possibly important in their role as escalators. They knew how important it was for films to increase the return on city centre real estate.

Adolph Zukor was one of the first and most successful entrepreneurs who escalated sunk costs. From 1912, his Famous Players Film Company was producing feature films, and in 1914 he was the driving force in the merger of five regional distribution organisations into a national one, called Paramount, which closed a 25-year supply contract with Famous Players, the Jesse L. Lasky Company, and later Bosworth Inc. and Pallas. This Paramount-group became the US market leader throughout the rest of the 1910s. For a full year, in 1914-1915, it was the only company that could provide cinemas with a full year's supply of features (104). During 1916, all these companies merged in several stages into Famous Players - Lasky Corporation (hereafter called Paramount).[74]

Besides increasing outlays on film production, Zukor's strategy consisted of changing distribution practices to get more of the marginal cinema revenues. The contracts between Paramount and its producing companies gave the producers 65% of gross rentals instead of the then customary flat fee, thus ensuring they obtained

[73] Lyons, *American Film Company*.

[74] Zukor later remarked about the merger: "We found interest between producer and distributor was not one." Zukor, "Origin." The dominant market position of Paramount is illustrated by the Department of Justice's prosecution during the 1920s, and later in the 1940s, when Paramount was the first-named defendant in a suit against the Hollywood studios, eventually leading to being found guilty by the US Supreme Court.

marginal distributor's revenue. Gradually, Paramount would introduce the same type of contracts with the larger cinemas in key cities it supplied.[75] Paramount also started national advertising campaigns for its stars and its features, which now showed disproportionate returns, because Paramount was a national organisation and because it would receive more of the marginal cinema revenues brought in by the increased advertising. Paramount's gross revenues increased from $10.3 million in 1917 to $17.3 million in 1918 to $12.0 million for the first six months of 1919.[76] Paramount obtained capital both through debt and equity. Wall Street bank Kuhn, Loeb & Co. arranged a $10 million preferred stock issue for Paramount in 1919, to finance its expansion into city centre cinemas.[77] According to Hampton, Zukor set the example which was followed by scores of competitors. "Practically all principal manufacturers concluded to adopt Zukor's compromise - pay large prices, if need be, to directors, novelists, dramatists and continuity writers, hoping thereby to find something novel and startling to attract the crowds to their own photoplays."[78]

Several other entrepreneurs increased production outlays at about the same time, most notably William Fox and Carl Laemmle. Fox started in film as a Nickelodeon-owner, and by the late 1900s ran a film distribution company in New York, one of the few that successfully defied the General Film Company, and whose lawsuits instigated the prosecution of the MPPC and GFC for violation of the Sherman Act. In 1914 and 1915, Fox embarked on a massive film production programme, increasing outlays from $92,000 in 1914 to $4 million in 1917. Fox was financially backed by a group of New York investors, led by William F. Dryden, president of the Prudential Life Insurance Company, which itself also

[75] Paramount executives remarked that initially this could only be done for the large cinemas, preferrably with exclusive supply contracts with Paramount, or Paramount even owning part of the exhibition company, as accounting and monitoring costs made it difficult to do the same for the medium-sized and smaller cinemas.
[76] Profits as percentage of gross revenue fluctuated, though, from 22.3 to 7.1 to 15.7 percent, respectively. "Gilmore," p. 76.
[77] Wasko, *Movies*.
[78] Hampton, *History*, p. 218.

invested in Fox Film Corporation.[79] It is one of the ironies of the escalation phase that Fox's quite unprudential forty-fold increase of production costs was partially financed by Prudential Insurance. Just as Paramount, Fox set up a nation-wide distribution organisation synchronously with increasing production costs, enabling him to advertise nation-wide, and to receive more of marginal distributor's revenues. Fox set up a British distribution subsidiary in 1916, followed by many more foreign subsidiaries during the 1910s, just as Paramount did.

Carl Laemmle started in film in 1905 when he bought and set-up a string of store-front theatres, and some years later he founded a distribution company. When in the late 1900s the MPPC/GFC tried to monopolise film production and distribution, Laemmle set up the Independent Motion Picture Company (IMP), a major competitor of the trust. In 1912 with several other entrepreneurs he formed the Universal Film Company, a nation-wide distributor, which distributed the output of a string of independent companies. In 1913, Laemmle acquired full control of Universal, and took care that an increasing part of Universal's supply was made by its own production company. In 1915, he set-up Universal City Studios, near Culver City, California, where the land alone cost half a million dollars.[80] Universal got its capital mainly through the stock market. In early 1916, it was reported that Universal's common stock had paid an annual dividend of 20 percent, on average, between its foundation in 1912 and 1916.[81] In the early 1910s, IMP and Universal were leaders in increasing production outlays but, later in the escalation phase, Laemmle became more cautious and did not follow the path of Paramount and Fox. Instead, he focused on supplying secondary cinemas outside the main population centres.

Paramount and Fox would become two of the five major Hollywood studios that dominated international film production and distribution since the 1920s. The

[79] Wasko, *Movies*.
[80] Bowser, *Transformation*.
[81] Common monthly dividend fluctuated between 0.5 and 3 percent. Davis, "Investing in the movies."

other three did not originate in the escalation phase but were based on companies that existed at that time. Metro-Goldwyn-Mayer was based upon Loew's, a theatre circuit stemming from the 1900s and Goldwyn Pictures, a not-so-successful escalator. Warner Brothers, Nickelodeon entrepreneurs from the 1900s, had entered feature film distribution in the 1910s, and bought Greater Vitagraph (the remnant of the MPPC companies) and First National (a producer-distributor set up by cinema chains in the late 1910s) in the mid-1920s, backed by Goldman, Sachs & Co. Radio-Keith-Orpheum, financially backed by Merrill-Lynch and for some time managed by Jack Lynch, was mainly based on the acquisition of Pathé Exchange in 1921, and of the Keith-Orpheum theatre circuit. During the late 1910s and the 1920s, these emerging Hollywood-majors started to buy large cinemas in key cities of the US, thus further increasing their share of marginal cinema revenues.[82]

Several other film companies grew rapidly and joined the jump in outlays, but did not prove successful. Triangle Film Corporation was founded in the summer of 1915. Its strategy was to set up a national distribution network (for 22 exchanges), to buy prestigious city centre theatres, and to spend huge sums on feature films made by the star producers D. W. Griffith, Thomas Ince and Mack Sennett.[83] Unlike its competitors, it aimed at films with famous stage stars based on classical plays, paying Sir Herbert Tree, for example, $100,000 for three months of his services, mainly used on Shakespeare's plays. Investors initially had great confidence in the strategy and Triangle stock jumped by 40 percent almost immediately after its flotation in July 1915, reaching a high of 78 percent over its $5.00 offer price in October 1915. After that, everything went downhill. The American public did not like stage actors and filmed stage plays,[84] and Triangle was underspending on feature production. It spent on average about $30,000 per picture,

[82] Contracts do not seem to have been optimal in many cases, because of monitoring costs. The forced divestment of their cinema-chains by the US Supreme Court in 1948 did not diminish the dominant position of the Hollywood-studios in film production and distribution.
[83] All Triangle information here based on Lahue, *Dreams*.

while Paramount was spending in the range of \$65,000 to \$75,000.[85] By October 1916, its shares were trading at only 40 percent of their issue price, and it was forced to sell its distribution network, which cost \$1.5 million annually to operate. It fetched \$600,000, with the buyer remaining contractually obliged to distribute Triangle's output. In 1917, the company was reorganised by a new production manager who cut costs by \$2.5 million annually but not by enough to avert receivership in early 1919.

Another loser was the Balboa Amusement Company of Long Beach, California.[86] Founded in 1913 by local businessmen, the company operated a large studio in which it invested \$400,000, thus becoming the largest employer and largest tourist attraction in Long Beach. It contained twenty buildings on eight acres and an eleven acre outdoor shooting area. Part of the studio was rented to other producers, and part was used by Balboa itself. In the fall of 1914, it made two long-term distribution agreements with Fox Film Corp. and Pathé Exchange, both national distributors. Balboa's strategy was to turn out as large a number of films of reasonable quality as possible. Subsequently, Balboa expanded production, turning out 6,000 feet of negative stock and 150,000 feet of positive copies weekly (its printing department alone represented an investment of \$50,000). But the massive increase in outlays on its film portfolio overextended the company. In early 1917, Balboa's distributors could not place its films, and with seventeen unreleased negatives in its vaults, it filed for voluntary bankruptcy. Without its own distribution network and without good contracts, Balboa saw little of the marginal distributor and cinema revenues. Moreover, its major focus was to increase its quantity of output rather than its films' perceived quality, which ultimately did not prove the optimal strategy.

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[84] This literary, theatrical cinema was possibly more popular with European audiences; in the market share time series (see Appendix), Triangle holds a substantially larger market share in Britain and France than in the US.

[85] This seems to connect to the finding of Sutton that only large jumps in endogenous sunk costs are profitable, not small steps (see above).

[86] All Balboa information based on Jura and Bardin, *Balboa*.

Another loser was the Mutual Film Company, founded as a distribution organisation in spring 1912. It released the films of several smaller companies, and acquired the Majestic and Reliance companies. It only half-heartedly joined the escalation phase. In 1916, with its stock below the 1912 issue price,[87] it tried to catch-up in one jump, offering Charlie Chaplin $670,000 a year to come to Mutual. Chaplin's films were extremely successful and extended the life of Mutual, but after a year he departed, and Mutual finally collapsed in spring 1919. One of its problems was probably that there were many different production companies for which it distributed and with which it had complicated financial relationships.

World Film Corporation was a company that briefly during 1914-1917 spent massively on producing and distributing features and then went spectacularly bankrupt. In the fiscal year ending June 1915, it made a profit of $329,000, roughly twenty percent of its outstanding share capital but paid no dividends.[88]

Besides the 'winners and the losers', there also were some companies that did not join the escalation phase. Four of the eight MPPC members formed the Vitagraph-Lubin-Selig-Essanay (VLSE) distribution company, which later merged with the Vitagraph production company, forming Greater Vitagraph, financed by investments from American Tobacco.[89] Although Vitagraph survived and remained profitable, and eventually started to make feature films, it remained a minor player. When Warner Brothers bought it in the mid-1920s, it was solely to acquire its US and foreign distribution networks, through which Warner planned to pipe its sound films. The other MPPC producers disappeared from the market. Edison quit production, Lubin went bankrupt and the other companies also dissolved or went bankrupt, or continued as infinitesimal, insignificant outfits. The MPPC companies' success was based on short films and they seemed unable to adapt. In 1914, as the feature film was starting its run to dominance of the film industry, William Selig

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[87] Davis, "Investing in the movies."
[88] Ibid.
[89] Hampton, *History*.

remarked “That the single reel photo-drama is the keystone of the motion picture industry becomes more apparent daily.”[90]

Benjamin Hampton, vice-president of American Tobacco, who negotiated an (eventually botched) merger between Paramount and VLSE, summed it all up:

> In every other business than motion pictures, caution contributes to success, but in the movies the conservative has almost invariably disappeared from the industry. History had repeated itself each time radicals and conservatives came into conflict. In 1917, while prudent manufacturers, unable to adjust their minds quickly to the high-pressure methods necessitated by the new conditions, were thoughtfully analysing wage demands, venturesome competitors rushed in and took their celebrities away from them, agreeing to salaries that generally were declared “impossible”.
>
> A few of these daring showmen got possession of stars that the public loved, and, although the prices paid seemed very high, they were able to pass the additional costs—through the theatres—to audiences, who paid the bill cheerfully. These producers made money, but others, more reckless than wise in the bidding contest, found themselves saddled with players who failed as box-office attractions. Such producers sustained severe losses in 1917-18, and some of them soon succumbed and joined the ultra-conservative producers in fading from the screen.[91]

Two major European ‘escalators’ existed, the French Pathé and the Danish Nordisk. Charles Pathé reorganised his American business into Pathé Exchange at the start of the war, travelling many times between France and the US. He profited greatly from having a national distribution organisation and from several expensive and highly advertised serials, i.e., films in weekly instalments. Pathé foresaw the serial becoming the industry standard and was cautious about spending too much on producing feature films, which he thought would be a passing fad. He also made profits with his newsreel, which had been the first regular newsreel in the US when it was introduced in 1909. The result was that, although Pathé Exchange remained profitable, and Pathé eventually switched to making feature films, it became somewhat marginalised and grew more slowly than the market. Nevertheless, as the

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[90] *Moving Picture World*, 11 July 1914, quoted in Bowser, *Transformation*, p. 214.

[91] Hampton, *History*, pp. 169-170.

profit figures in table 1 show, it remained profitable during the 1910s, except for 1914, and was a minor major player. In the early 1920s it was sold to Merrill Lynch, and eventually became part of RKO.

Table 1. Profits of Pathé Frères ($), 1911-1919.

	US	Total	US/Total
1911	388,374	852,980	45.5
1912	714,595	1,210,681	59.0
1913	899,491	1,401,020	64.2
1914	-357,082	-258,799	-138.0
1915	247,037	597,590	41.3
1916	460,484	1,253,724	36.7
1917	282,234	1,107,582	25.5
1918	269,280	1,070,611	25.2
1919	667,046	1,224,433	54.5

Note: total profits exclude the profits of Pathé phonograph subsidiary. Original figures in francs, converted by using exchange rate.

Pathé had obtained its capital from the Paris stock exchange, from a few industrial families from the Lyon region and from a few French banks, such as Banque Bauer et Maréchal. Still, Pathe's American operations must have needed large amounts of capital during the war, and it is unlikely that French sources would have handed out more capital, even if it had been allowed to leave the country. When Pathé arrived in New York in September 1914, his American subsidiary was on the verge of bankruptcy and it was rumoured that William Fox had offered to take it over. Pathé managed to reorganise the whole American company in a matter of a few weeks, to fend off creditors and to obtain new capital. Although conclusive evidence is lacking, it is possible that Merrill Lynch supplied Pathé Exchange with the necessary capital, since both Charles Merrill and Jack Lynch became members of the board in the 1910s and they eventually bought the whole firm.[92] The parent company eventually went bankrupt in the 1930s.[93]

Charles Pathé wrote that in the late 1910s he faced the choice between moving his company to Hollywood or divesting his foreign business and focusing on distribution in France. He chose the latter.

> They have asked me a lot: "Why did your American subsidiary Pathé Exchange not become a fully American company?" I have dreamed a lot of that possibility. Maybe I would have done it, had I been much younger, but this transformation would have meant the permanent relocation of our business from France to America, and my permanent residence in that country. I was too old to occupy me with that project.[94]

One other large European company adopted a strategy that came close to escalation. The Danish Nordisk company was financially strong and was one of the first to release feature-length films. In 1909, it even held talks with Pathé on the possible formation of a European film cartel, similar to the MPPC, which eventually came to nothing. Nordisk's 'home market' was Germany, which must have been very profitable until 1917, and it exported its films throughout the world. Nordisk bought distributors and cinema-chains in Germany, Switzerland and Austria.[95] However, it held only a small market share in the United States where it had problems with its sales manager and complained continuously that the American market was unprofitable.[96] In 1917, Nordisk's expansion came to a halt when the government forced it to merge its German assets into the UFA company.[97] While the sudden loss of the German 'home' market did not threaten Nordisk's continuity, it made continuation of an escalation strategy difficult. From being a potential European

[92] Perkins, *Wall Street*; Wilkins, "Pathé."
[93] It was, however, bailed out and managed by the French state and still exists today.
[94] Pathé, *Pathé Frères*, p. 97.
[95] See above.
[96] Mottram, "Great Northern."
[97] Kreimeier, *Ufa-Story*.

market leader, Nordisk changed into a small Danish film company and went bankrupt in the late 1920s.[98]

Several other French companies did not attempt an escalation strategy. Gaumont and Éclair, Pathe's main competitors in France and also quoted on the Paris stock market, both set up US and other foreign subsidiaries but these companies were cautious with increasing outlays on film production costs. In 1914, when the US escalators were spending at least \$10,000 to \$20,000 a film, Léon Gaumont, for example, instructed his US manager not to spend more than \$10,000 on the entire 1914 production portfolio.[99] Both companies eventually went bankrupt, Éclair in 1919, Gaumont in the 1930s.[100] Smaller French companies such as Méliès and Lux were possibly in a less advantageous position to embark upon an escalation strategy, and would have had difficulties in obtaining capital.

Of the smaller Italian production companies, two made attempts to increase outlays on film production costs and film portfolios. Cines appeared to have been making preparations for an escalation strategy. It had received capital from a group of US investors and had acquired German distributors and cinemas to increase its share of the marginal cinema revenues that its films generated. However, when the war started most of these investments were lost and Cines' future as a European market leader was shattered.[101] The second attempt was led by George Kleine, a Chicago film importer and member of the MPPC who made huge profits importing foreign films into the US, using his MPPC-license to acquire the films. In the early 1910s he took several of the big Italian spectacle films, such as the *Last Days of Pompeii*, on road shows. In 1913, he agreed with Pasquali, an Italian production company, jointly to set up a company that was to make large and expensive Italian historical spectacle films of the kind that were so popular in the US but now combined with US star actors and actresses. Preparations were made and

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[98] It was revived about a year later, and still exists today.
[99] See above.
[100] Both companies were revived and still exist today. Gaumont was bailed out and managed by the French state for some time during the 1930s.
[101] Kallman, *Konzernierung*, p. 3.

construction of a large studio complex outside Turin was started. However, the advent of the war caused the cancellation of the whole project. All that remained were the abandoned remnants of the never-finished studio compound. They still stand there today as a silent reminder of an era long-forgotten, a future never realised.[102]

[102] Cherci Usai, "Américain."

5. Market structure

Now the increase in sunk costs has been discussed, there remains the question of what happened to market structure. Sutton's theory implies that in R&D-intensive industries in which sunk costs are increased sharply, concentration will not converge towards zero as market size increases to infinity but will be bounded away from zero. This is an intentionally weak prediction; it does not say anything about the actual level of concentration, which can depend on many things (for example institutions, collusion) and which for individual industries may be explained by numerous fine-tuned economic models. The power of the weak prediction however, is that it makes the theory encompass other, industry-specific models.

A necessary condition for increased sunk costs to imply concentration bounded away from zero is that increases in outlays along a specific technological trajectory lead to sales across different trajectories. This propensity was measured by the index of homogeneity (see above). If this index is low, one would expect concentration to approach zero as the market grows to infinity. In the 1900s and 1910s film industry, the index of homogeneity could be measured in two ways. First, film could be considered to be part of the market for theatrical entertainment, and thus the relevant index would be film revenues (as one type of theatrical entertainment) over total theatrical entertainment revenues. Initially, however, until the mid-1910s, films were often parts of vaudeville and variety shows, and consumers bought one ticket for both a film and live entertainment, and, on the other side, many cinemas had a few live-entertainment acts interspersed with the movies. Second, film formats such as the feature film could be considered as product types forming part of the film market. Since the first type of index is difficult to measure, the second type is used here.

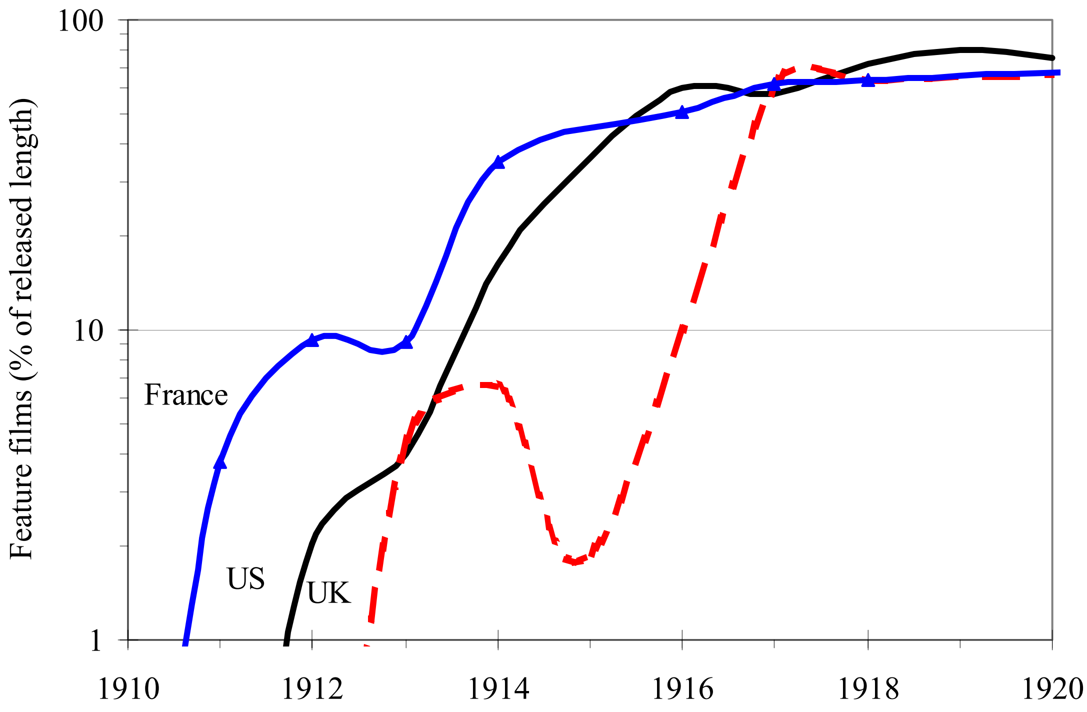

Figure 5. Film market index of homogeneity, US, Britain, France, 1910-1920 (total negative length of features as percentage of all releases): semi-logarithmic scale.

Source: see Appendix.

Figure 5 maps the released negative length of feature films as a percentage of total released negative length for the US, Britain and France. It shows a sharp increase in homogeneity during the emergence of the feature film, further supporting the idea that the feature film actually standardised the film industry. Since Sutton mainly studied industries already in existence, it is quite special that here an emerging industry is studied in which the index of homogeneity is far from fixed, but is dynamic and increases over time; this adds an important empirical-dynamic aspect to the model. The increasing homogeneity meant that over time, the increase in outlays on production costs of particular feature films became more and more profitable, since the feature film 'trajectory' itself became larger and larger vis-à-vis other trajectories/formats. These findings on homogeneity show how theory based on sunk costs can explain the development of the film industry.

Given the increasing and ultimately large homogeneity, concentration is expected to be bounded away from zero as market size grows to infinity. Figures 6a – 6c plot concentration, measured by the four-firm concentration ratio, against market size for the US, Britain and France and figure 6d shows concentration over time. The figures clearly show that as market size increases, concentration does not converge to zero, but stays above a lower bound of about a C4-ratio of 20 percent. Initially, concentration was very high, and fell as the market grew, but in the mid-1910s, when the feature film became the industry standard, first concentration stabilised as the market grew further, and then concentration actually increased. This period of stabilising and then increasing concentration coincided with the sharp decline of the European market share in the US and Europe (see figure 1 above). Although data on the concentration of film distribution are less reliable and not available for all years, there seems to have been a similar pattern but with a time-lag of a few years. This lagged concentration of distribution supports the theory that concentration was mainly driven by a jump in outlays on film production.[103] In figures 6a-6c, the above pattern seems less pronounced in France and Britain. This is because for those countries, data are only available from 1908/1909 onwards, so the first data are already from a market in which concentration has fallen. This is further supported by figure 6d, which shows the evolution of concentration in Europe was roughly similar to that in the US.

[103] Distribution data available from the author.

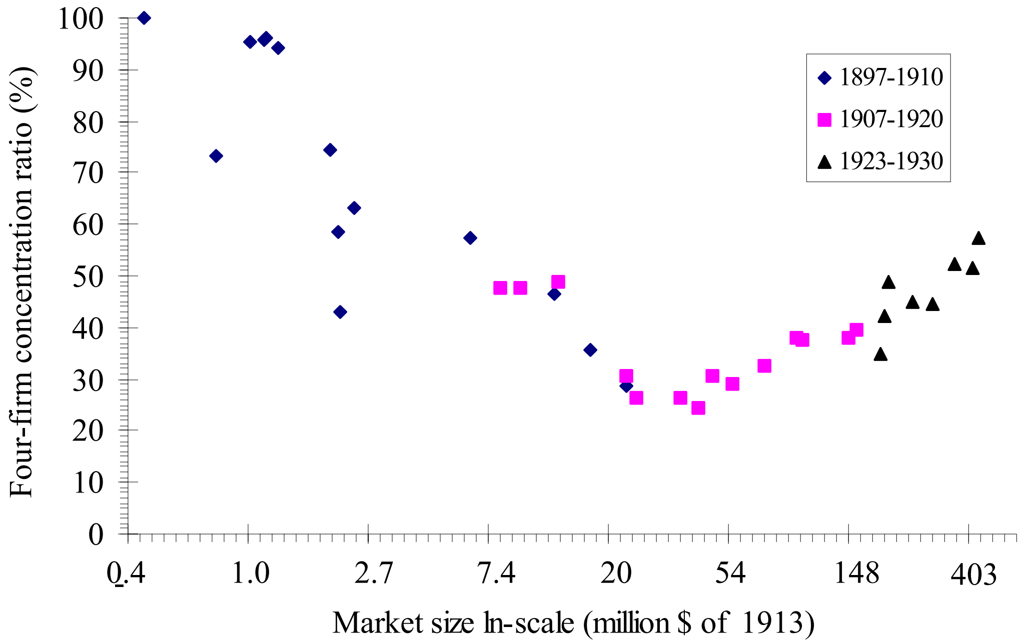

Figure 6a. Four-firm concentration ratio versus real market size for production, US film market, 1897-1930 (C4 vs. $ of 1913): semi-logarithmic scale.

Note: these three series are based on three different sources (see appendix) and may therefore not be fully comparable.
Source: see Appendix.

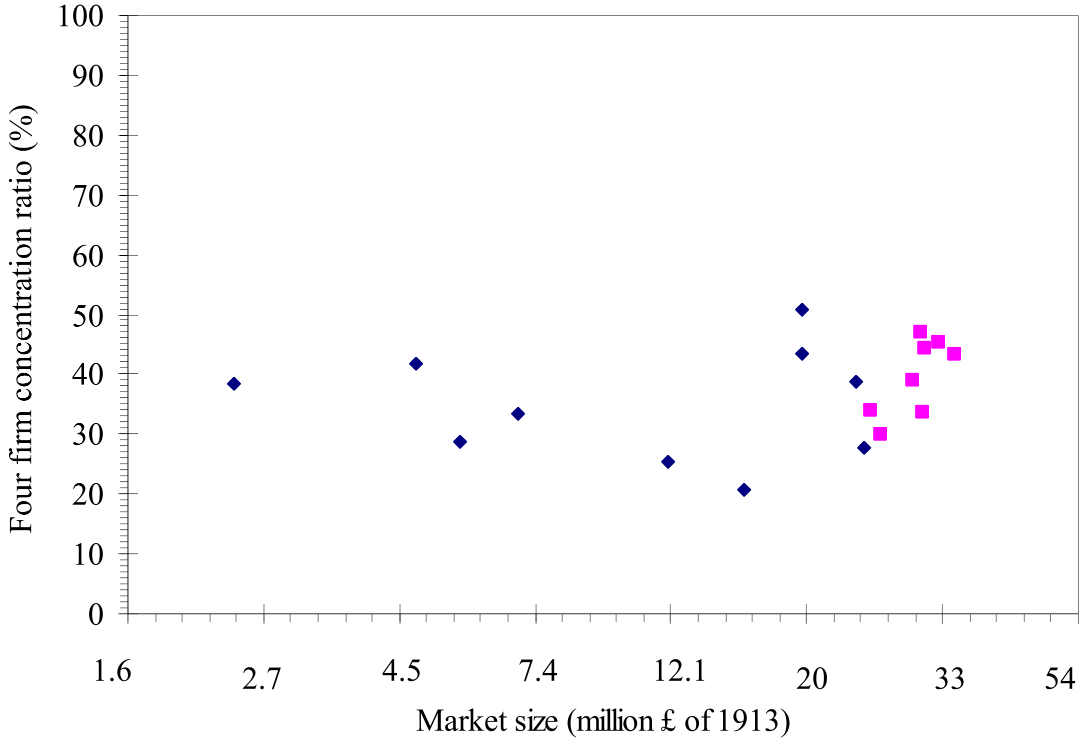

Figure 6b. Four-firm concentration ratio versus real market size for the British film market, 1909-1927 (C4 vs. £ of 1913): semi-logarithmic scale.

Note: diamonds refer to 1909-1918, squares to the 1920-1927. These two series are based on two different sources (see appendix) and may therefore not be fully comparable.
Source: see Appendix.

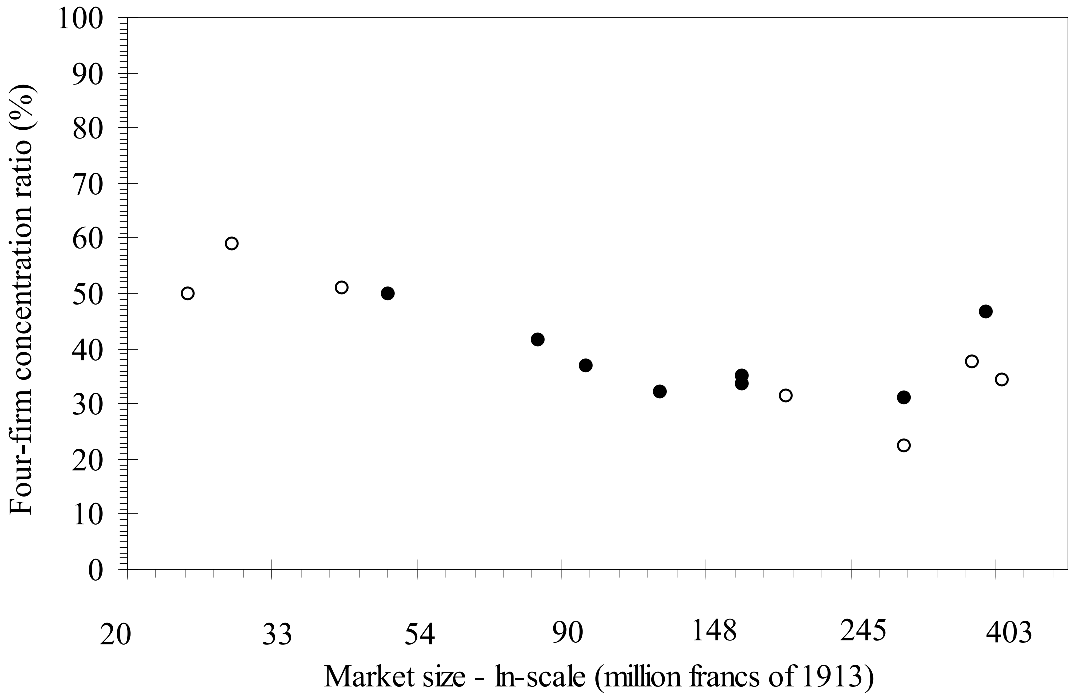

Figure 6c. Four-firm concentration ratio versus real market size for production, French film market, 1908-1923 (C4 vs. francs of 1913): semi-logarithmic scale.

Note: the open circles refer to a minimum level of concentration. For the left-most three, 1908-1910, the market share of the market leader, Pathé Frères, was not available and has been conservatively estimated (see appendix). For 1918, 1919, 1921 and 1922, for over twenty percent of films, no producer could be identified. Its is highly unlikely that these films were all made by the same film company, but it is possible that some of these films were actually produced by one of the largest four companies.
Source: see Appendix.

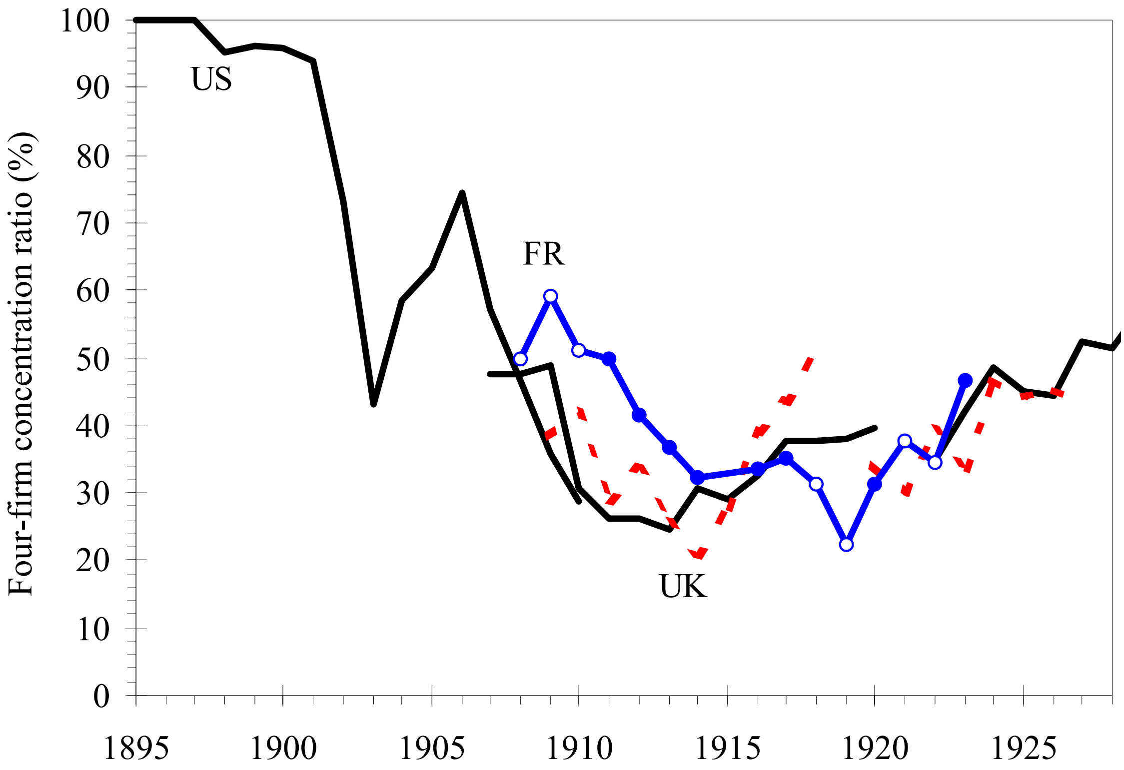

Figure 6d. Four-firm concentration ratio for the motion picture market, US, Britain and France, 1895-1927.

Notes:
Bold lines : US
Dotted lines: Britain
Bold lines marked with circles: France (open circles: lower-bound estimates, see figure 6c).
Source: see Appendix.

6. The failure to catch up

The escalation phase in the US markets sent shock waves throughout the world. In the early 1920s, the European film industry was ailing. Many film production companies went bankrupt, distributors switched to American films or were taken over by the emerging Hollywood studios. The surprising side to this collapse was that it was permanent. A European company could have solicited capital to set up a large studio complex outside Nice, Madrid or Naples, and could have bid away creative inputs from Hollywood and elsewhere. It could have escalated its film budgets, and the number of films produced to a level comparable to the emerging Hollywood studios and pre-sold its films in large blocks before they were even made. It could have set up distribution subsidiaries in every major market, and offered cinemas advantageous contracts, underbidding foreign industries. The venture could have made large profits and European films would have been shown more widely throughout the world.

Yet it did not happen. Not a single European 'major' emerged during the rest of the twentieth century. It did not happen despite abundant government protection from the late 1920s onwards. It did not happen despite the coming of talking pictures in 1927, which differentiated European films from American ones. It did not happen despite the attempts of several European companies to co-produce or merge. Few other industries exist in which Europe differed so greatly from America. Although the car industry, for example, was in a similar dismal state after the war, it did manage to catch up. The question, then, remains what was so special about the condition of the European film industry that it could not catch up.

An implication of the above theory is that for products with high sunk costs, market size is all-important, since total costs (nearly equal to sunk costs) will be dependent on the number of products sold. The European film industry could thus be so strong initially simply because sunk costs were low but, as sunk costs in the film industry grew, market size became ever more important and the European companies found themselves increasingly at a disadvantage in their small home markets. Charles Pathé underlined the growing importance of market size for film production just as the European market was disintegrating:

> The big countries, above all when they are very wealthy, are endowed more favourable than France, because their capacity to amortize is infinitely more significant and faster than our's. (...) Having the advantage of their huge interior market, which, concerning box office revenue, represents forty to fifty times the French one, thus three quarters of the world market, the Americans can engage considerable sums in the production of their negatives, amortise them completely in their home market, and subsequently conquer the export markets all over the world, especially those of countries that cannot afford the luxury of having their own national film production. The prime cinematographic importance of France in the world rested solely on its initial advantage and would have to disappear the day the building of the American film industry was finished. This day has come.[104]

As long as products are easily exportable, market size is closer to the size of the world market rather than to a particular domestic market. Unfortunately for the European companies, as sunk costs increased and market size became ever more important, the European market started to disintegrate and European film companies became increasingly locked into their small home markets. Both cultural and legal trade barriers increased. Before 1914, European countries were relatively open to each other's products but, during and after the war, consumers became more hostile to products of enemy countries, especially so with cultural products like films.

This resentment was reflected in legislation as German films were not allowed to be shown in France and Britain until the early 1920s and Germany responded with a similar policy. Before 1914 legislation concerning film trade was minimal as films were relatively new products. After 1914, however, taxes and duties increased, and in the mid-1920s, most European governments introduced special legislation controlling the number of foreign films that could be shown in a country. Access to the U.S. market remained unchanged and cannot therefore have

[104] Pathé, *Pathé Frères*, pp. 98, 92-93; see also Wilkins, "Pathé."

been a reason for Europe's decline in the U.S.[105] Also, as European film companies became more dependent on their own national markets, the growth of these relative to the American market was hampered because of the imposition of large amounts of entertainment tax on cinemas, varying from 20-50%. Thus, synchronously with the disintegration of the European home market, the individual European film markets also diminished, leading to a dead weight loss, and, moreover, decreasing the relative price of live entertainment.

One might be surprised that just four years made such a difference for Europe's film industry, a difference that has never been challenged, when U.S. dominance in many other industries was. However, the essential difference was that films were (copy)rights, and therefore, contrary to manufacturing industries, protection could be easily evaded, no foreign production plants were needed, and 'dumping' was easy because reproduction was costless. In the car industry, for example, production costs, transportation costs, tariffs, and the need for foreign production plants all were obstacles to absolute U.S. dominance. In the car industry no similar jump in endogenous sunk costs took place, since most costs were exogenous and dictated by technology. The 'creative inputs' in the car industry (i.e. experts working in R&D) were less scarce than in the film industry. Even so, since cars were goods and not rights, no vertical integration was needed to maximise profit because 'perfect' selling contracts could be written and foreign distribution networks were therefore less of an advantage. In the film industry high endogenous sunk costs, costless reproduction, easy tariff evasion and the absence of foreign production plants led to high scale economies and increasing returns in international trade. Further research is necessary to see if this finding also holds for other service industries.

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[105] Tariff rates for 1,000 feet of positive film declined from $ 207 in 1899 to $ 160 in 1909 to $ 97 in 1913 to $ 57 in 1922. Rates for 1,000 feet negative film changed from $ 206 in 1899 to $ 290 in 1913 to $ 172 in 1922 (all rates in 1982 dollars) [Thompson, *Exporting entertainment*, pp. 20-22]. Further, tariffs per se can only have a limited impact on foreign revenues of film companies, as a film essentially is a copyright and the number of viewings that this right generates in a foreign

While market size was the main and sufficient reason for the Europe's failure to catch up, a contributing factor was the combined effect of network externalities, first mover advantages in feature film distribution, the size of the gap in sunk costs and nationality as a product characteristic. First of all, theory on sunk costs could explain why concentration in the film industry increased and why the surviving companies were all inside the US market, but not why they were all in Hollywood. Hollywood not only left the European film industry shattered, but also the old East Coast US film industry and an emerging film industry in Florida, which did not have the disadvantages the European film companies had.[106]

The film companies located all together because they profited from substantial network externalities and this prevented the European film industry from catching up. First, since the Hollywood studios were the first to escalate, they could outbid competitors to buy creative inputs from factor markets around the world (i.e. mainly Europe and North America), which resulted in films with an even higher perceived quality, thus perpetuating the situation. Second, because the Hollywood studios were located close together, they could reach a higher return on their investments in creative inputs.[107] They could lower costs because inputs had less down-time, since less travel was necessary and because they could be easily rented out to competitors when not immediately needed.[108] They could increase revenue by using their inputs more effectively in order to increase perceived quality of the films. Having all the creative inputs together meant easy and cheap trials could be done to test various combinations in order to arrive at the optimal one. Third, Hollywood could attract new creative inputs for non-monetary reasons. Creative inputs often did not necessarily want to maximise their income but also, or even

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country cannot be taxed by customs. Unlike Europe, the U.S. did not introduce special legislation to limit the showing of foreign films.

[106] Nelson, "Florida."

[107] These investments could be protected by long-term, 'seven year' contracts.

[108] "Actors Equity Association." The year 1929 may not be representative for the whole interwar period, as studios were switching to sound films and the sound appeal of many silent stars was uncertain. Of the 277 actors and actresses, 110 came from the stage, which may indicate that

more, their fame and professional recognition. For an actress, an offer to work with the world's best directors, costume designers, lighting specialists and make-up artists was difficult to decline. From the Scandinavian countries, for example, no less than sixty star actors/actresses emigrated to the US between 1910 and 1940.[109] Europe's deteriorating political climate also prompted creative inputs to choose Hollywood. During the Nazi regime 470 highly skilled creative and technical people fled to Hollywood, not including many less-talented workers who emigrated before 1933.[110] Fourth, companies experienced external economies of scale in film production. They could easily rent out excess studio capacity (for example, during night time B-films were made). Also, many specialised suppliers existed and a producer knew that it was quite possible to find the highly specific products or services needed somewhere in Hollywood.[111]

As normal and self-evident as it may seem nowadays, it was not at all obvious that Hollywood would become the centre of the film industry. As late as 1924, the *Wall Street Journal* predicted that "The motion picture business of the next decade will be mostly within sight of the tower of the Woolworth building, except for tropical sets which can be made somewhere near Miami, Fla., 42 hours from Broadway. (..) It is safe to say that in the future, the bulk of production will be done within easy reach of Manhattan."[112]

A second factor blocking a European catch-up were Hollywood's first mover advantages in feature film distribution. Since they produced a large number of films, Hollywood studios could offer their films in blocks to cinemas. Because they had a substantial number of star creative inputs under contract and a history guaranteeing a minimum level of quality, they could contract their films to cinemas before they were even finished. An independent distributor could of course contract a large

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Hollywood was shedding silent stars in favour of stage talent. Nevertheless, this can not exactly be established, as the percentage of stage actors under contract in the silent era is unknown.

[109] Counted from Wollstein, *Strangers*.

[110] Counted from Horak, *Fluchtpunkt*.

[111] Storper, "Transit."

number of films from small producing companies and then block-book and blind-bid those to cinemas but this distributor would suffer a reputation disadvantage; cinemas would wonder if the supplied films would arrive at the agreed time and of the agreed quality. The distributor also faced the risk that producers would not deliver.[113] Production companies, in their turn, needed guaranteed access to distribution for two reasons: screen-time was a scarce resource, screens were limited and most revenue was made during just a few (holiday) weeks of the year, during which it was difficult to get screen-time.[114] Films were essentially copyrights, not products, and, by having an independent distributor, a film producer would let that distributor capture part of the rents of the copyright. Also, this 'hold-up' situation would lead to both parties having insufficient incentives to maximise film revenue because they were each afraid that the other would capture the rents.

Thus it was difficult for European companies to have their films distributed in the US. Price competition was not an option, as what mattered was not cinemas' (ex-ante) rental cost of a film but the (ex-post) cost per film ticket sold, and the latter depended partially on film quality. So, while in many other industries prices could be lowered until the product was sold, with low quality films this could not be done as, even at a price of zero, cinemas' average costs might be substantially higher than for high quality films.

The same happened on an international scale: mainly during and after the escalation phase the emerging Hollywood studios entered international film distribution, just as European companies left it.[115] Eventually they had their own direct distribution subsidiary in each major film market. This guaranteed access to foreign screen-time and maximised foreign rents captured. Once the Hollywood studios had set-up their subsidiaries, it was difficult for European companies to

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[112] "Movies come east from California," *Wall Street Journal*, 7 April 1924, p. 9. During the 1920s, most majors had both Hollywood and New York/Jersey studios.
[113] See also Kenney and Klein, "Block booking.".
[114] Sutton, *Technology*, pp. 197-230, makes this argument for distribution in the pharmaceutical industry. See also Caves, *Creative Industries*.
[115] Bakker, "America's Master," p. 240.

enter, as the scale of the Hollywood studios enabled them to 'block-book' and 'blind-bid', and to offer lower rentals in countries with a strong domestic film industry, using up most screen-time.

A third obstacle to a European catch-up was that, after the war, the gap in sunk costs already was too high. In the US market, production costs had escalated several times and many companies had exited the market in the process, either by bankruptcy or take-over. In order to catch up European companies had to make a jump in sunk costs of a size no US company had made before. European companies could not proceed in small steps as the Hollywood studios had done and use retained profits to increase sunk costs. Besides the unprecedented amount of capital needed, European financial markets were less willing and experienced to supply the film industry.[116] European government reports mentioned lack of finance as the main problem of their film industries and proposals for national film banks were made.[117] Small European home markets also meant European companies had to recoup their sunk costs through exports and these revenues would always come in later and more slowly than domestic revenues, thus further increasing the gap.

A fourth obstacle was that the national origin of films was part of the product characteristics of the feature film. This was so because the nation would figure in back-drops, costumes, habits, ways of acting and for sound films in the language artistic and crafts conventions and methods of film production varied between nations and constituted the style of a film.[118] Market research in Britain and the US from the 1920s to the 1950s showed that consumers considered nationality an integral part of a film's quality.[119]

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[116] The US financial markets had been quite willing to underwrite the film industry. The Bank of America in Los Angeles provided many of the Hollywood companies with credit. In the early 1920s, Chase National Bank and the Dupont family jointly backed Goldwyn Pictures. See also the section 'The Mechanics of the Escalation Phase,' above. [James and James, *Bank of America*, pp. 245-247, 429-430; Conant, *Antitrust*, pp. 25-26].

[117] But few carried out, only in Nazi-Germany.

[118] See for example the German expressionist films of the early 1920s.

[119] Bakker, "Building Knowledge." The researchers of Political and Economic Planning, for example, note: "(...)And American films do not have to rely for their playing dates abroad solely on the relatively low level of their rentals. Their cheapness is certainly an attraction to foreign

In advertising-intensive industries escalation phases, in which sunk costs rise substantially, help to increase the market share of a particular brand and this will often be quasi-irreversible in the long-term.[120] This implies that the escalation of sunk costs by US film companies not only increased the market share of the successful escalators but also collectively established the US nationality as a brand-characteristic for feature films, since the first feature films were American. Once consumers were used to a particular brand of film, the demand curve for a trial of another brand would be substantially lower than the vested brand, as the consumers had to invest energy in the trial and faced uncertainty of satisfaction. Only after trial, if the new brand was at least as good as the old one, would the demand curve get a somewhat similar shape.[121]

A memorandum by an advisor for Gainsborough Pictures, a British production company, written in 1930, at the end of the period examined here, sums it all up:

> 2.a. Western—outside our scope. 2b: Crook and underworld drama. We are at great disadvantage. 1. We have no gang-warfare to speak off. 2. We have no machine-gun battles in the street etc. etc. 3. Our policemen look ridiculous. 4. The Censors will not allow us to show realistically the relation between police and crooks, as shown in American pictures. 5. Lawlessness has no important status in England; we are too civilised. 6. We may not show third degree methods. In a word, crime in England is not romantic. 2c. Murder and court-room stories. We are at grave disadvantage because administration of English justice is far less dramatic than the administration of American justice; we have no bullying witnesses etc. etc. Also, wigs and gowns make for unreality. Also, there is too little corruption. 2d. Spectacular drama. Generally speaking we cannot compete with America in this class on the score of expense. 2e. College stories. University life in England has none of the glamour of American university life. If it were presented in the same petting party 'jazz age'

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exhibitors, but far more important is the fact that they are firmly established in the favour of foreign audiences. A generation of cinemagoers has grown up largely nurtured on American films. It idolises Hollywood stars, it apes Hollywood manners and customs, and it has come to regard the lavish productions and plots associated with Hollywood as the model which all other films should emulate." [Political and Economic Planning, *British Film Industry*, p. 243].

[120] See chapter 'How history matters' in Sutton, *Sunk Costs*, pp. 205-226.

romantic way, it would appear ludicrously unreal. 2f. Backstage musical stories. America does these brilliantly and spends so much money on them that she practically defies competition. 2g. Musical shows and operettas. Again, the financial question makes it difficult for us to compete in this class. 2h. Drama. Apart from the fact that America can (and does) almost always outbid us in this class, drama requires more than any other type extreme technical polish; and to assemble a unit of really first class technicians is beyond our means.[122]

[121] Scherer and Ross, *Industrial Market Structure*, pp. 580-592.
[122] Aileen and Michael Balcon Collection, Alan MacPhail, Memorandum on types of production, 7 May 1930, file A59.

7. Conclusion

At the dawn of the twentieth century, the European film industry was the strongest in the world, at times supplying over half of the American market. During just a few years in the 1910s, it lost not only its supremacy, but was marginalised, and was only kept alive by European government protection from the late 1920s onwards. This paper explained this extraordinary shift by using theory on sunk costs and market structure. It argued that during a certain phase of the market's evolution, a jump in outlays on film production would result in a disproportionate increase in revenue. The escalation parameter alpha, which reflects such a relation between sunk costs and revenue, increased substantially during the 1910s, for four reasons. Two reasons, similar to Sutton's findings for R&D-intensive industries, were product innovation -the feature film- and market integration -the integration of local entertainment markets into national entities, and national entertainment markets into an international one. Two additional reasons were the changing distribution practices which translated more of marginal distributor and cinema revenues into producer's marginal profits (an endogenous increase in alpha) and, finally, an increasing homogeneity, with feature films getting a larger share of the film market and the film market getting a larger share of the market for theatrical entertainment. The latter circumstance was related to the fact that the feature film increased the substitutability of filmed entertainment for live entertainment.

In the early 1910s, several smart entrepreneurs discovered that the film industry was in a transition from a low-alpha to a high-alpha industry and they invested large sums of money in portfolios of feature films, in some instances endogenously increased alpha by changing distribution practices. Many entrepreneurs joined in this escalation phase and doing this involved substantial risks. By the end of the 1910s, many of these had gone bankrupt. Only a few companies survived and they eventually became the five major and three 'mini-major' Hollywood studios that have dominated international film production and distribution since. Nearly all survivors had been involved in distribution and/or exhibition from early onwards, enabling them to be the first to discover the true value of, and changes in, the escalation parameter. Several, such as Paramount, the market leader, and Fox, had also been the very first movers in the escalation phase.

Because the escalation of outlays on film production reached its height during the First World War, the European film industry could not take part. European film markets kept growing during the war and many large European film companies made large profits from distribution, government propaganda, newsreels and army hardware orders but they simply could not afford to take part in the escalation phase. The British and French film companies did manage substantially to increase (Britain) or to keep up (France) feature film production during the war, and their governments were hesitant to let the large companies go bankrupt. However, joining the escalation phase involved massive increases in capital which were already risky in a 'certain' and fast growing film market like the US. European film companies simply could not get enough capital sufficiently to increase the quality and quantity of production. Also, the European market environment was uncertain, so it was not at all sure that the mechanism that translated a jump in outlays on film production into a disproportionate increase in revenue would be able to work well in such an uncertain market environment. Scarcity of labour inputs and government regulation further hampered production.

After the war, the European film industry could not catch up because, as sunk costs in the film industry increased, market size mattered more, while the European home market, which had been quite integrated before the war, was actually disintegrating because of war-related animosities, tariffs and regulation. Also, European market growth retarded relative to the American market because of the imposition of large amounts of entertainment tax on cinemas, varying from twenty to fifty percent. Thus, synchronously with the disintegration of the European home market, the potential size of the individual European film markets also diminished, leading to a dead weight loss, and, moreover, decreasing the relative price of live entertainment. Contributing factors blocking a European catch up were network externalities enjoyed by the emerging Hollywood studios, first mover advantages in feature film distribution, the size of the gap in sunk costs and nationality as a product characteristic.

By the 1920s, the shock waves of the escalation of sunk costs during these few years had forced most large European companies to give up film production altogether. Pathé and Gaumont sold their US and international business, left film making and focused on distribution in France. Their major competitor Éclair went bankrupt. Nordisk continued as an insignificant Danish film company, and eventually collapsed into receivership. The eleven largest Italian film producers formed a trust, which subsequently failed. One by one they fell into financial disaster. The famous British producer, Cecil Hepworth, went bankrupt. By late 1924, hardly any films were being made in Britain. American films were shown everywhere.

Had the escalation phase not taken place during the war, had the European film market not disintegrated, a more balanced international industry may have emerged, as later would happen in the international music industry, which experienced an escalation phase in the 1950s and 1960s with the rise of rock-music and the rapid downward diffusion of hifi-sets, just as the integrating European markets grew at their fastest pace in history. Unfortunately, one can only speculate about other outcomes. But it is clear that the path the industry followed over the rest of the century depended heavily on what happened during those few years in the mid-1910s.

Appendix

1. The US

1.1 Catalogue of the American Film Institute (AFI), 1893-1910:

This catalogue—based among others on contemporary catalogues, surviving films, the copyright registry, trade press, reviews, company archives—contains information on all films released in the US that have been tracked to have existed by AFI researchers, and thus excludes films of which no traces remain.[123] This means figures based on the AFI-catalogue do not reflect market size and market structure perfectly, but that it is, at present, not possible to construct a better data set. However, it is expected that possible incompleteness of the data will not significantly change the findings. The total and per company number of films released annually have been calculated from the AFI-catalogue (electronic version).[124] Company totals were used to proxy market shares and calculate C4-ratios.

1.2. The *Moving Picture World* (*MPW*), 1907-1920:

The *MPW* was the leading trade magazine, which published a weekly schedule of releases. For each year, the April schedules are taken to record market shares, since April is a fairly 'normal' month. For each film company and distributor's name and length were recorded. Market size and market shares were proxied by total released length, since average length of films diverged widely, as did their genre.[125] Cinema-going meant seeing a rapid succession of sketches, travelogues, newsreels, 'gymnastic' movies, dramas, cartoons varying in length from one minute to fifteen

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[123] American Film Institute, *Catalogue*, preface.

[124] Candace Jones, "Co-Evolution" also used this database to test a problem relating to management literature, without measuring concentration annually and without correcting released numbers for the sharp rise in average film length. Mezias and Mezias, "Resource Partitioning," used the paper AFI-catalogues for the years 1911-1929, also to examine a management issue.

[125] The author is grateful to John Sedgwick for the idea of measuring film length rather than number.

minutes (1,000 feet). Still, the number of copies sold per film, and the number of tickets per copy, may also have varied widely. However, before the feature film, films were generally sold by the foot, and were less differentiated. Only with the feature film did the pattern of costly misses and profitable hits emerge, and did companies depend on fewer, more revenue-generating films. This means that from the late 1910s, length increasingly understates market-size, and the concentration indexes probably understate concentration.

For calculation of market shares a monthly sample has been used because random sampling gives too large a margin of error. For example: in the US in 1910, 282 films were released in April. The largest firm, Vitagraph, had a share of 8.43 percent (20 films), the smallest, Éclair, 1.23 percent (6 films). Had these values been obtained by random sampling (n=282), at the five percent level of significance, the ranges would be 5.30-11.56 percent and 0.00-2.47 percent, respectively, and no significant difference in market share would exists between many firms.[126]

1.3. Revenue data 1923-1930:

These data are taken from the appendix in Finler, *Hollywood*, which is based on annual reports. For market leader Paramount revenue-data are lacking for these period. These data have been estimated by taking the company's revenue figures from the 1930s and projecting these back by using market growth.

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$$\sigma = \sqrt{\frac{N-n}{N-1}} \bullet \sqrt{\frac{\pi(1-\pi)}{n}}$$

[π=0.0843/π=0.0123, n=242, N=4,233]
Even with a quarter of the population sampled, the interval would still be large; for Vitagraph's, for example, 6.92 and 9.94 percent. See for example Cochran, *Sampling Techniques*, p. 73.

1.4. Market size:

From 1921 onwards, box office revenue figures are available from *Historical Statistics of the US*. This time series has been backpolated based on: 1) the data for 1909, 1914 and 1919 for total expenditure on theatrical entertainment [USDC, *Historical Statistics*]. 2) 1919 *Census of Manufacturers* - motion picture industry. 3) The AFI and *MPW* series.

For the AFI series, average annual length (established from a random sample of about fifty films) was multiplied by the number of films to get released negative length.

To estimate market size between 1907 and 1914, the *MPW* data have been combined with data collected by Thompson, *Exporting Entertainment*, for several individual weeks during each year, to make more precise annual estimates. For the years after, annual output equals fourteen times the April output.

To keep time series consistent, each of the three C4-time series has been tied to its own market size indicator. To be able to scale the three series in one figure, 1919 was used as bench mark year to convert the MPW and AFI market size (released length) data into constant dollars.

2. Britain

2.1 *The Bioscope (B)*, 1909-1921:

The same method was used as for the *MPW*.

2.2. The *Kinematograph Yearbook (KYB)*, 1920-1927:

The release schedules for April have been used to calculate concentration. Because revenues of feature films varied substantially and the major producers produced films that on average had substantially higher revenues than small producers, calculated concentration probably understates actual concentration and could in itself be a lower bound.

2.3. Market size:

Film box office revenue figures are available from 1934 onwards. Estimates are made for 1909-1930 based on time series on total entertainment expenditure by Prest, *Consumer Expenditure 1900-1919* and Stone, *Consumer Expenditure, 1920-1938*, times series of released negative length based on *B*, and, finally, a contemporary estimate for 1917 cinema revenues.

3. France

3.1 *Cine Journal (CJ)*, 1909-1923:

The same method was used as for *MPW*.

3.2. Market size:

Box office revenue figures are available from 1914 until the 1930s, initially only for Paris. The 1930s proportion between Paris and the country, combined with *CJ* data on released negative length, to arrive at time series estimates for 1909-1930. The estimates have been checked with research of Lefebvre and Mannoni, "L'annee 1913," on 1913 data.

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