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Economics at the Antitrust Division 2014–2015: Comcast/Time Warner Cable and Applied Materials/ Tokyo Electron

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Abstract During 2014–2015, the Antitrust Division achieved enforcement successes in a wide range of matters. Many, such as the case against American Express, played out publicly in court proceedings. But two of the Division's most significant investigations over the past year involved mergers that the parties abandoned in the face of concerns that were expressed by the Division. In each of these mergers, economic analysis played an important role in understanding their likely impact on competition. This article provides a sample of the types of issues that have been raised in recent antitrust cases that did not, ultimately, end up on the public record.

Keywords Competition policy · Mergers · Semiconductors · Telecommunications · Cable systems · Bargaining leverage

1 Introduction

During 2014–2015, the Antitrust Division of the U.S. Department of Justice (DOJ) continued to achieve enforcement successes in a wide range of matters. Many of these matters, such as the case against American Express, played out publicly in court proceedings. On those cases, the Division's web site contains a wealth of information; see www.justice.gov/atr. Some matters, however, are resolved before reaching this level of public discussion and disclosure.

This year, two of the most significant matters that were reviewed by the Division involved mergers that the parties abandoned in the face of concerns that were

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expressed by the Division. In each of these mergers, economic analysis played an important role in understanding their likely impact on competition.

Comcast's proposed merger with Time Warner Cable would have created by far the largest cable company in the US. Cable companies tend to operate in distinct geographic territories, and some argued that this meant no competitive impact from the merger. But disjoint retail territories were only a piece of the picture. These firms are two of the largest providers in the market for content distribution through traditional multichannel video "pipes" and broadband Internet access. As such, the merger posed a potential risk to the competition that currently dilutes each firm's leverage in bargaining with content providers for distribution access.[1] The Division's analysis suggested the potential for a significant loss of competition in this area if the merger were consummated.

In Applied Materials's bid to acquire Tokyo Electron, the Division explored the extremely dynamic competitive environment that is at the heart of the technology industry. Our work demonstrated the importance of analyzing the transaction using models that are well-matched to the particular facts and circumstances of competition within the industry. The results of that effort suggested that replicating the competitive significance of one of the most innovative companies in a sector that is virtually synonymous with innovation would be exceptionally challenging.

Confidentiality limits what we can report of the relevant evidence and analysis for matters that we investigate. Our hope is to provide a sample of the types of issues that have been raised in recent antitrust cases that did not, ultimately, end up on the public record.

2 Comcast's Proposed Acquisition of Time Warner Cable

Comcast announced in February 2014 that it had reached an agreement to acquire Time Warner Cable for $45 billion, in a merger that it asserted would generate both "pro-consumer and pro-competitive benefits".[2] Jurisdiction over the transaction was shared by the DOJ and the Federal Communications Commission (FCC), each of whom investigated its likely impact. Comcast abandoned the proposed merger on April 24, 2015, after the FCC and DOJ expressed significant competitive concerns.[3]

After executing its proposal to divest three million subscribers "in order to reduce competitive concerns",[4] the transaction would have left Comcast with approximately 30 million video subscribers, or just <30 % of the national total of

[1] See, e.g., Nevo (2014).

[2] Press Statement, Comcast, "Time Warner Cable to Merge with Comcast Corporation to Create a World-class Technology and Media Company," February 13, 2014. Available at: http://corporate.comcast.com/news-information/news-feed/time-warner-cable-to-merge-with-comcast-corporation.

[3] Press Statement, Comcast, "Comcast/Time Warner Cable/Charter Transactions Terminated." Available at: http://corporate.comcast.com/news-information/news-feed/comcast-twc-charter-transactions-terminated.

[4] Press Statement, Comcast, February 13, 2014, *supra*.

traditional (i.e., cable, satellite, and telephone company) subscribers.[5] It would also have given Comcast a large share of broadband Internet subscribers in the US.[6] While these national numbers provoked concern amongst consumer watchdog groups,[7] the service areas of Comcast and Time Warner Cable are concentrated in different cities, and Comcast reported that the two companies "do not operate in any of the same zip code[s]".[8]

This raises the question of how a merger that would have had no meaningful impact on concentration in the markets in which consumers purchase video or broadband services came to be viewed as problematic by the Antitrust Division.[9] The answer is that the proposed transaction, by giving the merged firm increased market power over intermediaries in the programming and interconnection markets, would likely have reduced competition in the video and broadband markets, leaving consumers with less choice, higher prices, and lower quality.[10] In what follows, we examine more closely the likely impact of the proposed merger in four markets.

2.1 Interconnection Market

Internet content providers supply various types of content to consumers: games, search, on-demand videos, social media, etc. This content is delivered to consumers by Internet service providers (ISPs) such as Comcast, Time Warner Cable, AT&T, and Verizon. Content providers must deal with ISPs to get their content—most of which is delivered by direct interconnection—to customers.[11]

Many interconnection contracts are negotiated bilaterally between content providers and ISPs. Industry wisdom holds that a content provider's leverage in such a negotiation depends upon the desirability of its content to consumers. This reflects the fact that demand for an ISP's product will fall if its customers cannot effectively access popular content such as Netflix or Amazon or YouTube.

[5] Liana B. Baker, "Comcast takeover of Time Warner Cable to Reshape U.S. Pay TV," Reuters, February 13, 2014. Available at: http://www.reuters.com/article/2014/02/13/us-comcast-timewarnercable-idUSBREA1C05A20140213. And Press Statement, Comcast, February 13, 2014, ibid.

[6] Liana B. Baker, February 13, 2014, ibid.

[7] Emily Steel, "Comcast's Track Record in Past Deals May be Hitch for Merger with Time Warner Cable," *New York Times,* April 21, 2015. Available at: http://www.nytimes.com/2015/04/22/business/media/6-senators-urge-rejection-of-comcast-time-warner-cable-deal.html?_r=0.

[8] Liana B. Baker, February 13, 2014, *supra.*

[9] When we discuss the video market we mean the market for the timely delivery of professional, full-length video programming to residential customers. When we discuss the broadband market we mean the market for the provision of fixed broadband Internet access services to residential customers.

[10] As discussed below, in the programming market, programmers contract with cable, satellite, and telephone companies and online video distributors to distribute their video content. In the interconnection market, Internet content providers contract with Internet service providers (ISPs) to distribute their content.

[11] Many content providers arrange for delivery of their content by contracting with other firms that directly interconnect with ISPs and provide other services. In some cases a content provider will deliver content to consumers on a network with which it is not directly connected by having a second network provide "transit service"—carrying the traffic across the second network and through that network's interconnection to the destination. This approach is not favored by many video and other content providers for whom delivery delay can be costly, because transit may be more susceptible to congestion.

An ISP's leverage, industry participants believe, is a function of the size of its customer base. Content providers need access to customers. The more end users that a content provider can reach, the easier it is to monetize investments (e.g., in programming), cover fixed costs, and permeate the national consciousness.

While it is clear that a content provider would prefer to reach many customers instead of few, it is not clear how the value of access to each additional customer changes as the content provider's access to customers increases. Economic theory predicts that if there are decreasing returns to access to customers, a merger of ISPs is likely to increase their leverage over content providers, potentially resulting in higher interconnection prices to Internet content providers and decreased consumer welfare. The opposite is true if there are increasing returns to access to customers. A key issue in the investigation was therefore the nature of returns to scale.

To understand this relationship, Antitrust Division staff estimated the empirical relationship between interconnection fees and the sizes of ISPs. They did this by constructing a database of contracts between ISPs and content providers that included contract-specific control variables (e.g., the date of the contract).

Under a wide range of specifications, the relationship between size and fees was found to be positive, statistically significant, and economically meaningful. While such a finding could also be due to larger ISPs offering higher-quality interconnection, staff was able to test and reject this possibility empirically by controlling directly for the quality of interconnection.

These findings are powerful evidence that content providers view ISPs' customers as substitutes, that the merger would reduce this competition amongst ISPs, and that the end result likely would be higher interconnection fees.[12]

2.2 Programming Market

Video content is created by studios, who then sell or license it to programmers (e.g., NBC Universal, CBS, Fox, etc.). Programmers traditionally contract with video distributors such as cable, satellite, and telephone companies to deliver their content directly to consumers' homes. Recently, online video distributors (Netflix, Sling TV, Amazon, etc.) have begun to popularize an alternative model in which they deliver programmers' content to consumers over broadband connections.

A programmer negotiates bilaterally with a video distributor to deliver its content. The programmer's leverage, it is believed, comes from the popularity of its content: a distributor needs compelling content, or consumers may switch to other distributors. The distributor's leverage, on the other hand, is believed to come from the size of its customer base. The advertising that a programmer can earn on its content depends upon the breadth of the audience that can see that content. Further, widely distributed content is more likely to garner buzz and praise than is content that can be seen only in a small part of the country. Thus, while Comcast and Time

[12] Higher interconnection fees are not inherently harmful to consumers. Indeed, in some circumstances, higher interconnection fees could be necessary to ensure optimal investment in interconnection facilities. The increase due to a merger's change in bargaining leverage, though, is not likely correlated with such beneficial circumstances. Indeed, as the later discussion of video and broadband markets will illustrate, the potential for indirect harm from this increased leverage was particularly acute in this case.

Warner Cable are rarely substitutes for access to particular customers, they are substitutes when a programmer is trying to build a national audience for content.

Our empirical work established that video distributors compete to distribute programmers' content and that larger distributors have more leverage.[13] Division staff assembled a database of the per-subscriber fees that programmers charge distributors for the right to distribute the former's content. Per-subscriber fees were then regressed on the size of video distributors (i.e., each distributor's number of subscribers) and contract-specific control variables.

Across a wide range of regressions the relationship of interest was consistent and statistically significant: larger video distributors pay meaningfully lower per-subscriber fees to programmers. Division staff interpreted this finding—which is consistent with economic theory—to mean that the merged firm would have gained additional bargaining leverage over programmers by removing programmers' ability to substitute the stand-alone firms for one another.[14] Alternative explanations for the finding, such as scale efficiencies, were considered and deemed to be unlikely given the facts of the industry.

2.3 Consumer Video Market

Consumers have traditionally purchased access to video content from cable, satellite, or telephone companies. In recent years a new option has emerged: online video distributors, such as Netflix. Online video distributors deliver their content over a consumer's broadband connection. While online video distributor pioneers (e.g., Netflix or Hulu) offer catalogs of content that can be watched at any time, newer competitors such as Sling TV or PlayStation Vue offer time-specific content that is even more similar to the content that is offered by cable, satellite, and telephone companies.

Online video distributors give households the option of cancelling video service and purchasing only broadband service from cable or telephone companies ("cutting the cord") or reducing their use of video services like on-demand video ("cord shaving"). This represent a significant potential threat to traditional video providers: according to public reports, in 2014 Comcast earned $20 billion in revenue selling video while Time Warner Cable earned $10 billion.

Online video distributors are vulnerable, however, because to deliver their service to consumers their traffic must travel over the wires of the very cable and telephone companies who are their direct competitors in consumer video markets. As previously discussed, the merged firm would likely have raised interconnection fees above the levels that are currently charged by the stand-alone firms. Such an increase would raise the marginal cost of online video distributors in the merged

[13] This empirical work is described in detail in Arons and Raskovich (forthcoming).

[14] Lower programming fees, all else equal, can be beneficial in that some portion of them would likely be passed on to consumers. However, the lower programming fees actually represent an increase in leverage, and this leverage can be used to extract other contract terms for which the interests of the merged entity and consumers would not be aligned. In light of the video and broadband market considerations that are discussed below, it is unlikely that an increase in bargaining power for the merged entity would, on net, have benefitted consumers.

firm's footprint, likely making them a less effective competitive constraint. The effect of this would likely have been reduced competition from a class of innovative firms in the consumer video market, resulting in lower-quality products or higher prices.

2.4 Consumer Broadband Market

Consumers typically have fewer options with respect to purchasing home broadband than home video because satellite providers cannot offer as competitive a broadband product. Indeed, most consumers have no more than one high-speed broadband provider available to them, and the bulk of the rest can choose only between their incumbent cable provider and their incumbent telephone provider (if it offers a high-speed product). In a few areas, so-called overbuilders such as RCN or Google offer broadband service in addition to whatever the local cable or telephone company offers.

Overbuilders, however, have a problem: many consumers want to purchase both video and broadband service. This may require overbuilders to offer both video and broadband service in a discounted bundle if they wish to compete with the incumbent cable companies—but providing video service is more expensive for overbuilders than for the large, incumbent cable companies because the former typically pay higher programming costs. The high cost of video service, indeed, has likely slowed the expansion of overbuilders, limiting the introduction of their beneficial broadband competition mostly to densely populated, high-income areas. Some traditional telephone providers may have limited the footprints for their high-speed Internet offerings for the same reason.

This problem could be mitigated by the entry and expansion of online video distributors. As online video distributors evolve forms that are increasingly closer to traditional consumer video service, the need for overbuilders to offer consumer video service along with broadband service will likely be reduced. The proposed transaction, by reducing the competitive influence of online video distributors (through raising the interconnection costs of online video distributors and other mechanisms that are beyond the scope of this article), would likely make overbuilders less effective competitors. This would reduce their competitive impact in markets in which they are already present and reduce the likelihood that they will expand into new markets. Both of these effects would harm consumers were they to occur.

2.5 Conclusion

Comcast and Time Warner Cable have disjoint service areas. Nevertheless, their proposed merger likely would have harmed consumers. This is due to the fact that Comcast and Time Warner Cable compete with one another in the upstream programming and interconnection markets. The loss of this competition would have adversely affected programmers and content providers in these markets and consumers in the video and broadband markets.

3 Proposed Acquisition of Tokyo Electron by Applied Materials

On September 24, 2013 Applied Materials Inc. (AMAT) and Tokyo Electron Ltd. (TEL) announced their intent to merge two of the world's largest providers of the tools that are used to manufacture semiconductor chips.[15] The Antitrust Division began investigating this transaction shortly after the merger announcement and found reason for significant concern.

3.1 Overview of Concerns

A modern semiconductor chip is made up of millions of interconnected transistors that are embedded on a wafer of pure silicon. The complex wiring of the transistors is constructed by successively depositing and removing (etching) different materials. In all, a chip may go through hundreds of distinct process steps as it moves from being a plain silicon wafer to a completed computer chip.[16]

As predicted by Moore's law 50 years ago, technological advances in areas such as materials science, manufacturing technologies, and chip design have resulted in dramatically more powerful chips (as the density of transistors increases) as well as dramatically lower costs. The tremendous technological change in the semiconductor industry in turn has facilitated the information revolution and driven change and productivity growth across the economy. Each move to smaller transistor sizes has required increasingly complex tools that implement the latest developments in precision materials science and engineering.[17]

A new semiconductor tool generally is developed in a working partnership between one of the leading-edge semiconductor manufacturers and a tool manufacturer. These leading-edge semiconductor manufacturers rely on continuously introducing chips that are more powerful, faster, smaller, and more efficient for their competitive advantage. This is the innovative process that drives the advances that are described in Moore's Law and that, eventually, filters through the rest of the semiconductor industry.

Commonly, one of the leading-edge semiconductor manufacturers will identify a particularly important bottleneck in its production process and inform potential tool suppliers that it would like to buy a new tool with specific capabilities to solve the issue: a "high-value problem". Tool suppliers will present their options for solving the problem with reconfigured or new tools. The chip manufacturer then selects a development tool and works intensively with that tool's manufacturer to refine and test the proposed solution. Before ultimately selecting a production tool, however, the semiconductor firm generally will evaluate (and possibly test) other available options.

[15] Press Release, Applied Materials, "Applied Materials and Tokyo Electron to Combine, Creating a New Global Innovator to Serve the Semiconductor and Display Industries," Sept. 24, 2013. Available at: http://www.appliedmaterials.com/company/news/press-releases/2013/09/applied-materials-and-tokyo-electron-to-combine-creating-a-new-global-innovator-to-serve-the-semiconductor-and-display-industries.

[16] The process steps are completed in a "chamber". Many chambers are often assembled on a "mainframe" that mechanically moves the silicon wafers between chambers.

[17] Moore (2006).

The set of potential tool manufacturers has, however, become limited. To be considered, a firm needs experience in solving similar problems and a track record of developing tools that work in high volume manufacturing (HVM). And, to have a realistic chance of solving the latest problem, which might involve pushing the frontiers of materials science, the would-be tool manufacturer needs to sustain significant investments in research and development.

It is not surprising, therefore, that progressively fewer firms have been able to compete successfully to develop and manufacture leading-edge semiconductor tools for high volume manufacturing.[18] Among the few remaining firms with this capability, AMAT and TEL are among the most able. Their advances in materials sciences and engineering have kept them on the forefront of developing, producing, and servicing deposition and etch semiconductor tools. In some areas of specialization they may be the only two viable options.

The proposed merger threatened to subject this vital component of the technological development process to a significant reduction in competition and possibly even monopolization. Naturally, the Antitrust Division would be concerned about that prospect and wary of the ability of any remedy to replicate this competitive dynamic. On April 26, 2015, AMAT and TEL announced that they had abandoned their purchase agreement, citing the Division's position on their proposed merger remedy.[19]

3.2 Narrow Overlaps or Broad Dynamics?

The outline of concerns above emphasizes the big picture of dynamic competition in this industry. Many common tools in antitrust analysis are derived from static models of competition. These often can be adapted to reflect some dynamic elements of an industry. But, the framework generally relies on some continuity of the market so that measures like past market shares have some clear relevance for future outcomes.

In an industry where the primary nexus of competition is a dynamic where firms win or lose successive waves of innovation developments, static measures may miss significant competitive overlaps or poorly measure their significance. That does not mean that past performance will be irrelevant to the analysis. But, the facts that are drawn from the past should always be interpreted in light of the competitive model that is appropriate to a specific case.

[18] Press Release, ASML, "ASML Completes Acquisition of Cymer," May 30, 2013. Available at: http://www.asml.com/asml/show.do?ctx=5869&rid=48841. Press Release, Lam Research, "Lam Research and Novellus Systems to Combine in $3.3 Billion All-Stock Transaction," December 14, 2011. Available at: http://investor.lamresearch.com/releasedetail.cfm?releaseid=633499.

[19] Press Release, Applied Materials, "Applied Materials, Inc. and Tokyo Electron Limited Agree to Terminate Business Combination Agreement," April 26, 2015. Available at: http://www.appliedmaterials.com/company/news/press-releases/2015/04/applied-materials-inc-and-tokyo-electron-limited-agree-to-terminate-business-combination-agreement.

3.2.1 Indicia of Currently Competing Tools

During its investigation, the Division identified a variety of specific overlaps where the merging firms sold existing deposition or etch tools in competition with each other. For these tools, the merger would have eliminated the competition between AMAT and TEL products in areas where there are few, if any, competing alternatives that customers could turn to. While straightforward to analyze, this set of overlapping tools represent a very small amount of the merging parties' revenues. That fact should not be particularly surprising in light of the dynamic described above. Tools that solve the current high-value problems for leading edge semiconductor manufacturers often will be at the stage of the process where one solution has won or another is not yet at production volumes.

The dynamic can be partially included in the analysis by identifying tools that are currently in the development stage while other solutions are either still under consideration or are the existing production solution. For these tools, the merger would have eliminated some potential competition to become a development partner in the near term and product competition in the longer-term. These dynamic extensions to the static analysis capture more of the relevant competition, but are still only a slice of the larger dynamic cycle of competitive interaction.

3.2.2 Dynamics of Future Tool Competition

Taking a broader view, the Division found that the existing overlap between the specifically identified tools is emblematic of a broader competition to develop new deposition and etch semiconductor tools. Due to their extensive capabilities, AMAT and TEL are well positioned, if not uniquely positioned, to develop new technologies and engineer HVM tools to solve the industry's high-value deposition and etch problems.

AMAT and TEL have developed assets and built capabilities that give them a vital lead over smaller competitors.[20] They have highly developed experience in material sciences and a broad array of existing chambers (and underlying chamber engineering and technologies) that are currently used in HVM. They also have proven HVM mainframes (to which the chambers are attached) and engineering experience in designing and constructing mainframes.[21] Their existing collections of such "building blocks" give AMAT and TEL a significant advantage in developing a new tool to solve a customer's high-value problem. Moreover, they both have the engineering staffs and R&D facilities in place to develop the new tool as well as the financial resources (R&D budgets) to take on more risky projects and persevere through setbacks.[22]

[20] The Lam Research Corp. is a remaining large competitor, which has significant capabilities in developing etch and some deposition tools in competition with AMAT and TEL.

[21] See http://www.appliedmaterials.com/product-library and http://www.tel.com/product/index.htm for descriptions of AMAT's and TEL's products.

[22] Applied Materials spent over $1.4 billion on R&D in FY2014. See Press Release, Applied Materials, "Applied Materials Announces Fourth Quarter and Fiscal Year 2014 Results." Available at: http://www.appliedmaterials.com/company/news/press-releases/2014/11/applied-materials-announces-fourth-quarter-and-fiscal-year-2014-results. TEL spent over $750 million on R&D in FY2014. See Tokyo Electron Annual Report 2014. Available at: http://www.tel.com/ir/library/ar/document/ar2014_all.pdf, p. 2.

Thus, for a variety of high-value deposition and etch problems, AMAT and TEL are most likely to achieve an HVM solution and to do so quickly. Thus, they likely will compete to develop and manufacture the next generation of HVM deposition and etch tools, as the leading-edge semiconductor manufactures make the transition to smaller and smaller transistor designs.

A less capable firm (without the collection of building blocks) *potentially* could solve a high-value problem. It would, however, likely take significantly more time to do so, be significantly more costly, and face a lower probability of success. A leading-edge semiconductor manufacturer risks losing its competitive advantage if its progress is slowed by choosing a less capable tool development partner: one that might not succeed or might not deliver an HVM capable tool quickly enough. Thus, a less capable firm is at a significant competitive disadvantage in competing to develop and produce leading-edge tools.

Because AMAT and TEL are so capable, they are often the two best (or among the three best) development partners to solve a leading-edge semiconductor manufacturer's high-value deposition and etch problems. The merger would have eliminated the competition between AMAT and TEL to be selected as a future development partner as well as any eventual competition between their competing products.

3.3 Implications for Remedy

To replace the competition that would be lost in such a transaction, a successful divestiture remedy must accomplish two goals: resolve the specific areas of overlapping competing tools *and* replace the lost future competition to develop new deposition and etch tools. The first goal could potentially be achieved by divesting overlapping tools and associated assets to a third party. The second goal—preserving the dynamic competition—is much more difficult to assure.

It is almost axiomatic that a divestiture will involve less than the entirety of the acquired firm. When overlaps are a small portion of the combined businesses, it may be possible to assemble divested assets to constitute essentially the same competitive entity that existed pre-merger. In the AMAT/TEL case, however, the relevant assets that would be needed to solve the *next* high-value problem could draw from a range of experiences with material sciences and engineering as well as from existing chambers and mainframes capable of HVM. It is a tall order to prove that whatever is kept by the acquirer won't be important, or that a potential divestiture buyer will already have a similar breadth of assets or expertise.

Accordingly, a satisfactory structural remedy would have been difficult to construct. The parties in this matter abandoned the proposed merger after the Antitrust Division found "that the proposed remedy would not have replaced the competition eliminated by the merger, particularly with respect to the development of equipment for next-generation semiconductors".[23]

[23] Renata Hesse in Press Release, U.S. Department of Justice Antitrust Division, "Applied Materials Inc. and Tokyo Electron Ltd. Abandon Merger Plans After Justice Department Rejected Their Proposed Remedy," April 27, 2015. Available at: http://www.justice.gov/opa/pr/applied-materials-inc-and-tokyo-electron-ltd-abandon-merger-plans-after-justice-department.

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