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Economics at the Antitrust Division 2015–2016: Household Appliances, Oil Field Services, and Airport Slots

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Abstract This article provides an overview of economic analysis in three prominent merger investigations and litigations: Electrolux's proposed acquisition of General Electric's appliance division, Halliburton's bid for Baker Hughes, and United Airline's attempt to acquire additional airport slots at Newark Liberty International Airport. In each, the parties abandoned their proposed transaction after the Division had filed suit to block the acquisition. While we cannot recount all the analyses underpinning these outcomes, we hope to provide some insights into the challenges of enforcing antitrust law and the way in which economic analysis in particular is used to address those challenges.

Keywords Airlines · Antitrust · Competition policy · Energy economics · Innovation · Mergers

1 Introduction

This is the last U. S. Department of Justice Antitrust Division *Review of Industrial Organization* article for the present administration, and an opportunity to reflect briefly on the advances in antitrust enforcement over the past 8 years. As Acting Assistant Attorney General Renata Hesse recently described (Hesse 2016), during that span the Division significantly increased its litigation activity, with more than 75 days spent in court, as compared to 27 during the previous administration. On the civil side, the number of mergers blocked or abandoned as a result of Division action rose from 16 to 43, and there are three more in active litigation as this article was being written.

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Anticompetitive conduct has been challenged in settings that range from health care to technology hiring to eBooks. Hundreds of corporate and individual defendants have been prosecuted for criminal violations of the antitrust laws, with fines imposed that were in excess of $9 billion. But the statistics tell just part of the story.

Mergers have grown not only in number, but also in size and complexity. Merger investigations, which comprise the bulk of Division civil enforcement activity and resource deployment, have risen to meet those challenges. For the Economic Analysis Group (EAG), this often has meant adapting our approaches to consider and test more complex theories of competitive harm, tailoring the theories to the facts and circumstances of the transaction under review. In markets in which consumers choose from among firms with local product or service offerings, the Division has identified situations where firms with broad geographic or product market footprints are especially close competitors, and challenged mergers that substantially lessen competition in that space. When our analysis indicated that a transaction was likely to eliminate a particularly disruptive competitor or enhance coordinated effects, we have blocked mergers, required an asset divestiture to preserve competition, or imposed conditions to facilitate entry and expansion by challengers. EAG also has been instrumental in advancing the Division's understanding of bargaining leverage as a competitive harm even where customers (downstream) or suppliers (upstream) may wish to contract with both of the merging parties. That theory of harm has played a role in a number of important investigations.[1] Finally, Division investigations have looked beyond static price effects. Reductions in innovation, for example, are particularly problematic, as these both slow the process of market expansion and economic growth and may diminish price competition in later generations of products. Innovation concerns have been cited in a number of recent investigations, including the Halliburton/Baker Hughes litigation that is discussed in more detail below.

EAG is involved not only in developing and testing the evidence on competitive harm, but also in assessing the structure and adequacy of potential remedies to problematic transactions. As the Division has made clear through its actions and in public speeches by its leadership,[2] proposed remedies must fully replace the competition that would be lost by a merger. Economic expertise can be especially valuable when preserving competitive vitality post-merger may dictate more creative solutions than a simple divestiture of some overlap assets between the parties. In the case of USAirways/American Airlines, those conditions took the form of substantial asset divestitures at capacity-constrained airport strongholds, which enabled the expansion of low-cost carrier networks to compete with legacy carriers. In the 2016 acquisition of SABMiller by AB InBev and accompanying sale of Miller's interest in the MillerCoors joint venture to Molson, the Division cited concern about enhanced coordination that could result from increased multimarket contact between ABInBev and Molson, and imposed conditions that require AB

[1] See Nevo (2014) and Hill et al. (2015), for example.

[2] See, e.g., Baer (2016).

InBev to maintain a level playing field for smaller, particularly craft, beer producers' access to distributors.[3]

Mergers in innovative sectors may pose particular challenges for assessing the responsiveness of divestitures to competitive concerns. These may require the Division to determine whether a firm's innovative capabilities reflect more than the sum of its innovation capabilities within discrete product lines, and whether piecemeal divestitures—even when large in dollar volume—would be adequate to maintain competitive vibrancy by a divestiture buyer. This played a key role in the Division's rejection of a settlement in the subsequently abandoned Applied Material/Tokyo Electron investigation (Hill et al. 2015) and, as described below, in the decision to challenge Halliburton's acquisition of Baker Hughes despite the parties' assurances they would offer billions of dollars of divestitures.

During the past year, the Antitrust Division went to trial in a number of significant cases. In the three discussed below, the parties abandoned their proposed transaction after the Division had filed suit against them. Consequently, competition in cooking appliances, oilfield services, and flights in and out of Newark airport did not see the substantial reductions that were predicted by the Division.

While that outcome—i.e., the avoidance of a reduction in competition—is the goal of a suit to block an acquisition, the abandoned litigations also mean that a tremendous amount of excellent work by the staff of the Antitrust Division will go mostly unseen by the public. We cannot recount all of that work here, much less the excellent analysis in all of the other matters that were investigated by the Antitrust Division this year. But we hope this overview of the economic issues in each of these cases will provide some insights into the challenges of enforcing antitrust law and the way in which economic analysis in particular is used to address those challenges.

For more detailed insight into the way economics has been used in our merger enforcement, we turn next to discussions of our litigation in *U.S. v. AB Electrolux, Electrolux North America, Inc., and General Electric, Co; U.S. v. Halliburton Co. and Baker Hughes, Inc.*; and *U.S. v. United Continental Holdings, Inc. and Delta Air Lines, Inc.*[4] We encourage interested readers to review the more expansive material on these and other matters available at the Division's website: https://www.justice.gov/atr.

2 Electrolux's Bid to Acquire GE's Appliance Division

In September 2014, the Swedish home appliance manufacturer AB Electrolux, which owns the Frigidaire brand, announced its intent to acquire the home appliance division assets of General Electric for $3.3 billion. After a 9-month investigation, the Antitrust Division filed suit in July 2015 to block the transaction on the grounds

[3] *U.S. V. Anheuser-Busch InBev SA/NV and SABMiller PLC*, Competitive Impact Statement, July 20, 2016, p. 12. Available at: https://www.justice.gov/atr/file/877621/download.

[4] Case materials for each of these are available at: https://www.justice.gov/atr/antitrust-case-filings-alpha.

that it substantially lessened competition in the supply of each of three types of cooking appliances: ranges, cooktops, and wall ovens. A 4-week trial commenced in November 2015 and ended prior to rebuttal testimony on December 7th, when General Electric exercised its contractual right to terminate the deal, collect a $175 million break-up fee from Electrolux, and find an alternative buyer.[5] One month later, GE agreed to sell its home appliance division assets to the Chinese manufacturer Qingdao Haier for $5.4 billion; that transaction closed on June 6, 2016.

2.1 Two Channels to Market

In its Complaint, the Division noted that appliances are sold through two distinct channels with different competitive characteristics.[6] To emphasize these differences, the Division defined two markets for each type of cooking appliance: a narrow market that consists of the appliances that are sold through a contract channel; and a broad market that consists of all sales of the appliances. Conceptually, the same point could be illustrated by defining a market for sales through retail channels to end customers.

In practice, the exact line between a retail customer and a small builder or remodeling professional can be blurry. By nesting the definitions of the two markets, the Division also made clear that the point is not to define precisely a line between customers who are and are not affected or between two completely unrelated markets. Rather the definitions make clear that the merger has an impact on all customers, but some customers may be more affected or affected in different ways.

2.1.1 The Contract Channel

The manufacturers' contract channel primarily serves the large builders who purchase directly and the distributors who service smaller builders. These customers routinely request bids to supply the appliances for new homes and apartment complexes. Approximately 26% of all cooking appliances are sold to contract channel customers (Whinston 2015, 92).

For these customers, a supplier's ability to deliver appliances during a narrow window in the construction process is critical. If an appliance is delivered too early, there is a risk of theft; if an appliance is delivered too late, the overall production schedule is disrupted with potentially large financial implications: for example, if the closing date on a new home is delayed. In order to provide the level of service that these customers demand—particularly the ability to schedule timely delivery on large numbers of units—GE, Whirlpool, and increasingly Electrolux have deployed extensive distribution capabilities in the United States.

[5] Antitrust Division press release, 12/7/15 (https://www.justice.gov/opa/pr/electrolux-and-general-electric-abandon-anticompetitive-appliance-transaction-after-four-week).

[6] The Division's Complaint in *U.S. v. AB Electrolux, Electrolux North America, Inc., and General Electric Company*, filed in US District Court in Washington, D.C. is available at https://www.justice.gov/atr/file/624751/download.

In 2014, Electrolux and GE together manufactured 64.4% of cooking appliances sold in the contract channel in the U.S., with Whirlpool comprising all but 2.5% of the remaining units (Whinston 2015, 43). The intensity of competition between the firms was corroborated by GE's "SmartQuote" data in which Electrolux was indicated to be the competitor in roughly half of the contract channel quotes in which a competitor was identified (Whinston 2015, 17).

2.1.2 The Retail Channel

The manufacturers' retail channel reaches end users through familiar outlets such as The Home Depot and Lowe's as well as through smaller independent retailers. Large or small, the retailers are generally selling to customers who are making a particularly infrequent purchase and vary widely in their willingness or ability to pay for a given set of characteristics in an appliance. Approximately 74% of all cooking appliances are sold to retail channel customers (Whinston 2015, 92).

Sales to the retail channel as a whole are less concentrated than are sales to the contract channel. LG and Samsung are well-established brand names that can readily sell through retailers even without the extensive distribution infrastructure that is needed to serve contract customers. Nevertheless, Electrolux and GE combined to manufacture 59.2% of cooking appliances sold to all customers (Whinston 2015, 35). So even with the additional firms participating in the retail channel, the products of GE and Electrolux seemed to be the best choice for many customers. We will discuss below one of the main reasons this would be true. But, at a high level, the intense retail competition between these two firms can be seen in the fact that GE cited only competition from Electrolux in nearly one quarter of its justifications for changing prices to "meet competition" (Whinston 2015, 20).

2.2 Competitive Effects

In some cases, a merger may so substantially reduce the set of competitors that competitive effects throughout the relevant product market are relatively straightforward to predict. Contract channel markets for major cooking appliances are a good example. Only three firms have the infrastructure that is necessary to participate significantly in these markets. And the substantial costs of developing the requisite infrastructure would insulate post-merger prices from the threat of inducing entry by any other manufacturers.

In other cases, a merger may be likely to affect some customers in the product market much more than others. A product market, for antitrust purposes, is commonly defined using the question that is posed by the "hypothetical monopolist test"[7]: Would a hypothetical monopolist of every product in that market find it profitable to raise the price of those products, or would there be sufficient substitution away to rival products outside the market so as to render the price

[7] See U.S. Department of Justice and Federal Trade Commission Horizontal Merger Guidelines (2010), section 4.1.1. Hereafter, Horizontal Merger Guidelines (2010).

increase unprofitable? That does not mean that all products within the market are equally close substitutes to each other.

For example, consumers who prefer higher-quality, higher-priced cooking appliances with additional burners, convection capabilities, and stainless steel finishes are likely to prefer other similarly-situated cooking appliances, relative to lower-quality options. And households shopping for a $500 mass market range are unlikely to respond to an increase in its price by choosing instead a $2000 premium range. More generally, whenever products are distinguished by their characteristics, the competitive effects from a given merger of multiproduct firms are unlikely to be uniform across all the products that may comprise a well-defined antitrust market.

One stylized fact about cooking appliance sales in the US is that Electrolux, GE, and Whirlpool offer a full array of appliances under multiple brands at a range of prices. Other competitors, such as Samsung and LG, offer a much more limited set of products that are focused on the higher end.[8] Isolating the bottom 40% of cooking appliances based on wholesale price (e.g., all ranges that are sold at a wholesale price below $365) reveals that Electrolux and GE manufacture 71% of units, and Whirlpool manufactures all but 3% of the remaining units (Whinston 2015, 40). The high concentration among the merging parties and Whirlpool for this large segment of demand suggests that price increases among the least expensive cooking appliances is a particularly likely outcome of the proposed merger.

Arguably, though, that prediction is subject to the future positioning of LG and Samsung. The parties pointed to LG and Samsung's decade-long growth in laundry appliances in the retail channel and hypothesized that a similar pattern was likely in cooking appliances going forward.[9] Testimony and documents from executives at those companies, however, revealed significant barriers to such downward expansion in cooking appliances.

2.3 Comparing Competitive Effects to Cost Savings

The parties in this case claimed that the merger would generate variable cost efficiencies of 3.25%.[10] Since even a monopolist would, in theory, pass some portion of variable cost savings on to consumers in the form of lower prices, it is worth considering how the likely anti-competitive effects compare in magnitude to such an effect.[11]

A number of mechanisms have been employed for quantifying competitive effects in differentiated product mergers. Fundamentally, they all estimate the same familiar intuitive relationships and differ mostly in which variables are known or

[8] Together these five manufacturers comprise 85.3% of unit sales and 95.7% if one attributes Kenmore's share to Electrolux. Whinston (2015), p. 35.

[9] *U.S. v. AB Electrolux, Electrolux North America, Inc., and General Electric, Co*, Case No. 15-01039-EGS (D.C. 2015), December 4, Transcript at 4605:5–7.

[10] Whinston (2015), at 56, 57.

[11] Note that this assumes, for the sake of argument, that the claimed savings would occur as a result of the merger and only as a result of the merger; this is an assumption that the Division has often found reason to question.

unknown or in how they deal with predicting demand away from current equilibrium levels. But the basic relationship is the following.

Competing suppliers of differentiated products are constrained by the threat of consumer substitution. Specifically in this case, GE and Electrolux each price their products reflecting that, if each firm independently were to increase its price, some proportion of their customer base would instead purchase appliances from rival manufacturers—*including from each other*. The effect of this constraint is particularly strong when higher-margin products are at risk because the value of the sales that could be diverted is high relative to a potential gain on remaining sales. When two competing suppliers of differentiated products merge, some fraction of the diverted sales are internalized, and the constraint is loosened. In this case, customers' pre-merger substitution between GE and Electrolux products would no longer constrain their prices post-merger.

The Horizontal Merger Guidelines (2010) endorse a measure of upward pricing pressure (UPP)[12] to quantify the impact of the no-longer-diverted sales between the parties. Professor Michael Whinston testified on behalf of the Division that UPP, as a measure of the "fundamental forces"[13] of competition, was a useful way to quantify the likely competitive effects of the merger; this was the first time that this measure has been used by the Division for this purpose in a contested merger case.[14]

A benefit of using UPP is that it can be interpreted as equating the competitive effect of a merger with a change in the firms' costs (specifically, the opportunity cost of those diverted sales that the merger internalizes). So expressing UPP as a percentage of total cost makes it directly comparable to the predicted variable cost savings.

The UPP statistics that Whinston presented at trial are reproduced in Table 1. As reflected in the parties' substantial shares and margins in cooking appliances, these are all a significant fraction of costs. They demonstrate that the reduction in marginal cost that would be required to offset the likely unilateral incentive for the merged entity to raise price was far greater than the claimed savings.

The comparison between UPP and claimed marginal cost savings in a merger will not always be this stark. One limitation of UPP is that it does not predict the outcome of a merger with the kind of precision that may be possible when second-order effects—such as the shape of the demand function or cross-price elasticities—can be estimated or approximated reliably. As such, it is often described as a "screening mechanism," with the implication that one of the mechanisms for quantifying effects that do consider more of these second-order effects may be necessary if the UPP measures are not definitive. In this case, though, the first-order effects embodied in UPP are clear enough on their own.

It should also be noted that where, as here, the diversion is parameterized based on an assumption that the shares are a stable outcome of unobserved diversions over

[12] Upward pricing pressure is formalized in Farrell and Shapiro (2010).

[13] Specifically, the UPP for GE on a particular cooking appliance is the product of the sales of that appliance that are diverted from GE to Electrolux times GE's margin on those sales, and *vice versa* for Electrolux's diversion to GE.

[14] See Sect. 6.1 of Horizontal Merger Guidelines (2010).

Table 1 UPP estimates from Whinston's (2015) trial exhibits

	Ranges (%)	Cooktops (%)	Wall ovens (%)
For all customers			
Electrolux UPP	16	47	33
GE UPP	15	13	17
For contract channel customers			
Electrolux UPP	25	54	34
GE UPP	15	13	12

time, it is useful to examine supporting evidence on the validity of that assumption. If there is a compelling reason why the products of the merging parties are further or closer in product space than shares alone would suggest, one may want to explore estimating the diversion parameters directly. In this case, though, the high rates of diversion among the parties' cooking appliances consistently implied by multiple sources—including the market shares over time, the "meet competition" data, and the SmartQuote data for the contract channel—as well as evidence from documents and testimony all helped confirm the picture that is portrayed in Table 1.

2.4 The Relevancy of Whirlpool–Maytag (2006)

One unique factor in this case was that in 2006, the Antitrust Division chose not to challenge Whirlpool's acquisition of rival appliance manufacturer Maytag despite their considerable market shares in residential clothes washers and dryers.[15] That decision prompted some disagreement in the academic community (e.g., Baker and Shapiro 2008) and led to a retrospective study on the subject by Ashenfelter et al. (2013, 2014), who identify a price effect using a difference-in-differences approach.

At trial, the parties' economic expert, Jonathan Orszag, presented a retrospective analysis of the Whirlpool–Maytag merger. He argued that predicted post-merger concentration levels in laundry appliances were higher following the 2006 Whirlpool and Maytag merger than were those predicted for cooking appliances following the 2015 acquisition of GE by Electrolux, and effects from the Whirlpool–Maytag merger should therefore form an upper bound on the scope of potential harm.[16]

Orszag's econometric model mirrored the difference-in-differences approach in Ashenfelter et al. (2013, 2014) but with two important conceptual differences: the use of wholesale prices instead of retail prices, and the inclusion of a measure of marginal cost as an explanatory variable for price.

Orszag concluded that prices for clothes washers and dryers had declined as a result of the merger. Indeed, his model found that post-merger changes in concentration levels and changes in prices were *inversely* correlated: The most substantial declines in price were among clothes washers and dryers, which were

[15] Antitrust Division press release, 3/29/2006 (https://www.justice.gov/archive/opa/pr/2006/March/06_at_187.html).

[16] *U.S. v. AB Electrolux, Electrolux North America, Inc., and General Electric, Co*, Case No. 15-01039-EGS (D.C. 2015), December 4, Transcript at 4570: 9–14.

most affected by that merger, and the least substantial declines were among cooking appliances, which had the smallest increase in concentration.[17]

Even though the 2010 Horizontal Merger Guidelines describe "recent mergers" as a natural experiment that may be "informative regarding the competitive effects of the [current] merger,"[18] the discrepancy in results between the Ashenfelter et al. (2013, 2014) study and Orszag's raises a practical question of how much reliance to afford such studies. While studies of recent prior mergers have been used to infer parameters of demand, it would require more confidence and certainty to extend their application to big-picture questions such as the right policy on merger enforcement thresholds.

Consider, for example, how difficult it is to square Orszag's findings with well-established economic theory. Admittedly, mergers among competitors may result in price declines if the cost efficiencies are sufficiently great. So prices might decline in a more concentrated product market by a greater amount than in a less concentrated market, if the cost efficiencies that accrue to those markets from the merger differ in just the right way. However, a systematic finding that increased concentration serves to lower prices *after controlling for costs* is more likely to reflect an error in the econometric specification or methodology, than it is to reflect a most unusual pattern of competition among manufacturers of home appliances.

Moreover, the proximity of the Whirlpool–Maytag merger's closing with the Great Recession potentially confounded anything one might learn from such an analysis. Indeed, the Whirlpool–Maytag transaction closed immediately prior to a 5-year period during which new residential construction, which is the primary impetus for major appliance sales, fell from approximately 1.4 million housing units per year to approximately 0.4 million units per year (Whinston 2015, 4); with a once-in-a-generation liquidity crisis occurring in the middle of this time frame. All else held constant, such a massive contraction in demand will put downward pressure on appliance prices for reasons that are unrelated to the merger.[19] More generally, the efficacy of any retrospective study hinges on the existence of a convincing control group of products that are unaffected by the merger; because different products respond differentially to collapses in demand, it is reasonable to suspect that no such group was available during the Great Recession.

In some respects the evidence in this case shows far less about what really happened after the Whirlpool–Maytag merger than about the difficulty of identifying and executing informative merger retrospectives.

2.5 Conclusion

As mentioned above, GE withdrew from the transaction before the trial ended. While it is tempting to conclude this reflects their acknowledgement that the

[17] *U.S. v. AB Electrolux, Electrolux North America, Inc., and General Electric, Co*, Case No. 15-01039-EGS (D.C. 2015), December 4, Transcript at 4580: 2–10.

[18] Horizontal Merger Guidelines (2010), Sect. 2.1.2.

[19] Orszag included measures of housing unit starts as a control in his regressions, but given that the magnitude of the financial crisis was unlike any previous episode since the Great Depression, it is difficult to know whether that would be close to adequate to control for the impact of the aggregate demand shock.

evidence against the transaction was compelling—i.e., that the Electrolux acquisition of these assets from GE would lead to significant net increases in price to a substantial number of customers—we may never know how the court would have ruled. Indeed, GE may have been looking not only at the prospect of retaining the break-up fee but also may have anticipated the higher sales price that they negotiated with Haier as motivation for abandoning the litigation. But even if we cannot assume that GE implicitly assessed its odds of a favorable opinion as low, it seems safe to say that consumers should be much better off as a result of this challenge.

3 Halliburton's Proposed Acquisition of Baker Hughes

On November 17, 2014, Halliburton announced that it would acquire Baker Hughes in a deal then valued at nearly $35 billion. Halliburton announced that it was willing to divest business that accounted for up to $7.5 billion in revenues, if required;[20] but Halliburton never convinced the Antitrust Division that a divestiture that would adequately preserve competition was possible.[21] On April 6, 2016, the Division sued to block the deal. On May 1, 2016, the parties jointly abandoned the deal, which triggered a $3.5 billion breakup fee that was paid by Halliburton to Baker Hughes. The failure to get antitrust approval, both in the US and abroad, was cited as a reason for the abandonment.[22]

3.1 The "Big 3"

Halliburton, Baker Hughes, and Schlumberger are the "Big 3" in the oilfield services business. They have unmatched scale and scope across a wide variety of products and geographies and are the leaders in developing innovative solutions for the ever-changing technical challenges of oil and gas extraction. The tools and services that are developed by the Big 3 allow exploration and production companies (E&Ps) to drill and develop energy resources that were considered non-viable a generation ago.

In its Complaint, the Division named 23 relevant products and services in which the deal would create anticompetitive harm in the United States market. Without remedy, the deal would have caused many of these markets to be dominated by the merged firm and Schlumberger. Figure 1 shows the market shares that were alleged in the Division's Complaint, and demonstrates that, for the majority of products and services, the merging firms and Schlumberger combined for more than 75% market

[20] Halliburton Press Release, November 17th, 2014. http://www.halliburton.com/public/news/pubsdata/press_release/2014/HAL-BHI-Joint-Announcement-Press-Release.pdf.

[21] Complaint in *U.S. v. Halliburton Co., and Baker Hughes Inc.*, April 6, 2016, paragraph 73. Available at: https://www.justice.gov/atr/file/838661/download. Hereafter, "*U.S. v. Halliburton* Complaint".

[22] Halliburton-Baker Hughes Joint Press Release, May 1st, 2016. http://www.halliburton.com/public/news/pubsdata/press_release/2016/halliburton-baker-hughes-terminate-merger.html.

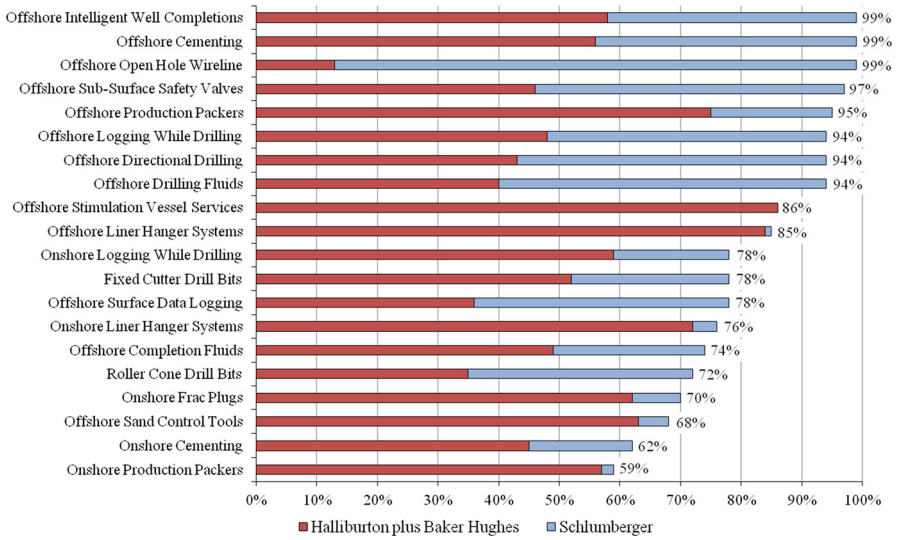

Fig. 1 Merger harms customers by leaving them with two dominant suppliers

share in the United States. For at least eight products, their combined share exceeded 90%.[23]

The consistency of the Big 3's leadership across product categories prompted a key question: Do structural features of the Big 3 set them apart from others in a way that a product-by-product analysis would fail to identify? If so, there would be reason to doubt the efficacy of any remedy that addressed relief on a piece-by-piece basis, without assembling a new competitor that would be capable of becoming a member of a new Big 3. The unique advantages of a competitor with scale and scope and, in particular, their effect on that competitor's incentive and ability to innovate, were central to the investigation.

3.2 The Role of Innovation

Halliburton and Baker Hughes, along with Schlumberger, are the undisputed technology leaders in the oilfield services business. Both companies invest hundreds of millions of dollars in research and development every year and own thousands of patents that relate to oilfield technologies.[24] The technological leadership of the Big 3 goes back many years, and the Division was concerned that the impact of the merger would be felt for years to come. The reduction in the number of innovative

[23] Shares are for the U.S. market as alleged in the Complaint. Three problematic markets are not shown because of data limitations: Cased Hole Wireline Services for Rigs in Deepwater, Multilateral Completion Systems, and Integrated Refracturing Solutions.

[24] In 2015, Halliburton invested $487 million in research and development, while Baker Hughes invested $483 million. *U.S. v. Halliburton* Complaint, paragraphs 4–5.

firms could have resulted in effects on future prices, service quality and perhaps the quality and variety of innovation itself.

The technology competition between the Big 3 takes a variety of forms. They regularly invest in new technologies to market broadly to E&P companies, acting both as market leaders and as followers to each other's leads. They partner with smaller companies to bring technologies to market—often as part of an acquisition of the smaller company. They also respond to requests from particular E&P companies for customized technologies, and they offer the most sophisticated engineering services that are available to solve challenges that arise during drilling. Although Schlumberger and Halliburton would have continued to compete in technology after the merger, direct competition between the parties would have been lost. Consequently, the kind of scenario described in the Division's Complaint—where "a major E&P company procuring an integrated suite of completion equipment for wells in the ultra-deepwater Gulf of Mexico" pit Halliburton and Baker Hughes against each other in a "design challenge" to create the best solution—would no longer be an option.[25]

Reflecting its dynamic nature, the state of innovation varies across the 23 relevant markets. Some of the relevant markets, including Integrated Refracturing Solutions, involve technologies that have not yet been proven. The Division's Complaint describes this as a nascent emerging market that is "poised to take off", and alleges that "only the Big Three are serious participants in this market because of the breadth of their product lines, their ability to integrate products and services, the quality of their reservoir data, and their capacity to conduct the necessary R&D".[26]

Some of the other relevant markets, such as Frac Plugs, are currently being driven by cutting edge engineering and material science. Break-through advances in these technologies are having significant impacts on the economics of oil and gas production in the unconventional resources of North America.

A few of the relevant markets feature relatively mature technology, but even here the market leaders compete to refine old methods as a way to differentiate themselves and stay ahead. Importantly, given the dynamic nature of innovation, the capacity to innovate plays a role in defining not just the firms that currently compete at the top end of the market, but also the firms that will be competing at the top end into the future.

The persistent innovation leadership of the Big 3 is supported by their scale and scope. Because they can earn returns to their research and development projects all over the world, they have more incentive to innovate than do firms that operate only in the United States. They also have more avenues to develop new technologies. For example, having a global scope allows the Big 3 to gain experience with new technologies in offshore wells outside the United States before introducing them in the Gulf of Mexico, which is one of the most challenging environments in the world.

The scale of the Big 3 allows them to exploit synergies across product lines. For example, their research in materials science and engineering supports innovation in several product lines as does their basic research in sensors. And successful products

[25] *U.S. v. Halliburton* Complaint, paragraph 68.

[26] *U.S. v. Halliburton* Complaint, paragraphs 63–64.

in one application can serve as a basis to develop for related applications. For example, wireline sensing tools that were developed for use in a drilled wellbore are often later adapted for use in the more rugged environment of logging-while-drilling.

3.3 The Efficiencies Argument

According to David Lesar, the Chairman and Chief Executive Officer of Halliburton, the transaction would "combine the companies' product and service capabilities to deliver an unsurpassed depth and breadth of solutions to our customers".[27] Conceivably, this increase in scale and scope might offer an enhanced platform for developing the tools and services customers need. But that did not appear to be the case.

Because Halliburton and Baker Hughes are already highly integrated service providers, the merger offered little in the way of synergies. More than 90% of the revenue that is earned by Halliburton comes from products and services that are also offered by Baker Hughes.[28] Although there would likely have been some synergies between particular tools, the R&D portfolios were better characterized as competing with each other rather than as complementary. In line with this, Halliburton and Baker Hughes planned to eliminate expenditures on overlapping research projects. These cuts would have eliminated competition between their respective versions of emerging technologies.[29]

3.4 Implications for Remedy

In considering possible merger remedies, the Division follows a guiding principle "that a successful merger remedy must effectively preserve competition in the relevant market".[30] Innovation was central to the competition that the Division identified in the oilfield services industry. So, any proposed remedy would need to ensure that the divested assets were sufficient to preserve this and all other elements of the ongoing rivalry between the Big 3. As detailed in the Division's Complaint, however, the divested businesses would inherently suffer from a number of shortcomings that made it highly unlikely that they could ever replicate the dynamic competitive position of Baker Hughes.

First, "Halliburton would generally retain the more valuable assets from either Defendant while divesting the less significant assets".[31] This meant that the divestiture buyer would be acquiring a "worst of breed" mix of technologies.

[27] Halliburton Press Release, November 17th, 2014. http://www.halliburton.com/public/news/pubsdata/press_release/2014/HAL-BHI-Joint-Announcement-Press-Release.pdf.

[28] *U.S. v. Halliburton* Complaint, paragraph 11.

[29] *U.S. v. Halliburton* Complaint, paragraph 69.

[30] U. S. Department of Justice, Antitrust Division Policy Guide to Merger Remedies, June 2011, p. 1. Available at: https://www.justice.gov/sites/default/files/atr/legacy/2011/06/17/272350.pdf.

[31] *U.S. v. Halliburton* Complaint, paragraph 78.

Second, the proposed divestitures would not, in many cases, have transferred intact businesses. For example, certain services such as optimized pressure drilling were carved out of the drilling services divestiture.[32] In some product lines, onshore and offshore assets would have been separated, with onshore assets being held back. Whenever an existing business unit has to be divided, existing synergies are likely to be disrupted. In this case, R&D facilities, groups of research personnel, and existing intellectual property would have to be divided.[33] The consequent "sharing" of intellectual property—with one company likely licensing to its would-be competitor—would have further complicated the transaction.

Even in the relevant markets where the proposed divesture was nominally global, the Division noted that the buyer might not continue operations at a global scale. In some countries, it is common for E&P companies to seek a single integrated provider for all oilfield services. If the buyer of the divestiture assets failed to qualify for such projects due to its limited scope, it would have less incentive to continue operations in those countries. And, eventually, its position as a competitor for technologies with global applications would have eroded.

As Attorney General Loretta Lynch concluded: "The proposal is complicated, risky and regulatory, but most importantly, it falls far short of preserving—much less enhancing—the current competitive dynamic. Simply put, the parties' merger puts competition at risk in too many markets. It's not fixable and it should be enjoined".[34]

4 United's Proposed Acquisition of Slots at Newark

On June 16th, 2015, United Airlines and Delta Air Lines entered into two contractually separate agreements for long-term leases of takeoff and landing permits, which are commonly known as "slots". At John F. Kennedy International airport ("JFK"), Delta paid $14 million to United for an effectively perpetual lease of 24 year-round slots, three summer-only slots, and three winter-only slots.[35] This transaction, which was not challenged, resulted in United's complete exit from JFK.

In a mirror-image deal, United paid $14 million to Delta for a similarly long-term lease of 22 year-round slots and two summer-only slots at Newark Liberty International airport ("Newark"). The Antitrust Division challenged this latter acquisition, alleging a violation of Sections 1 and 2 of the Sherman Act. Prior to trial, however, the Federal Aviation Administration ("FAA") eliminated the slots regime at Newark airport. Following the FAA's announcement, United and Delta abandoned the Newark transaction.

[32] *U.S. v. Halliburton* Complaint, paragraph 74.

[33] *U.S. v. Halliburton* Complaint, paragraph 74.

[34] Remarks of Loretta Lynch, April 6, 2016. https://www.justice.gov/opa/speech/attorney-general-loretta-e-lynch-delivers-brief-remarks-press-conference-call-announce.

[35] FAA slots regulations prohibit the sale of slots, but leases are permitted. The two slots leases were written in such a way as to be in effect so long as they continued to be permitted by law. The contracts also allowed for the possibility of the leases becoming permanent sales if ever the law should change to permit slots sales.

4.1 Background on Slots at Newark Airport

At the time of the Complaint, the FAA administered slots regimes at four major US airports. These airports included Reagan National in Washington, D.C., LaGuardia and JFK in New York City, and Newark in Newark, New Jersey. A slots regime limits departures and landings in an effort to control congestion and improve on-time performance.

At Newark, each slot is a permit to either land or take off during a specific half-hour window between 6:00 am and 11:00 pm. The FAA determined that Newark airport could accommodate 81 operations per hour (or 1377 per day) and still meet acceptable levels of on-time performance. The slots were initially allocated in 2008 in proportion to historic operations patterns.

By design, slots are limited in supply and essential to any airline that wants to serve a slot-controlled airport during peak demand hours. In other words, the need to acquire slots—which are a scarce and necessary input—is a barrier to entry. When barriers to entry are high, dominant firms can exercise market power without fear of being challenged by new entrants. The FAA required each airline to use allocated slots at least 80% of the time. While this requirement imposes some limits on an airline's ability to exercise market power by withholding slots from service, it still leaves room for a dominant carrier to withhold a significant portion of its portfolio.[36]

Indeed, United (the dominant carrier at Newark by far, with 73% of the slots) conceded that it regularly left many slots unused. It attempted to justify its withholding strategy as beneficial to airport operations. As United's vice president of network operations later explained, "We never used all of our slots at Newark because the airport can't support that many flights… We subsidize the performance of the entire airport by not operating all of our slots".[37] United's economic argument was that it chose to restrict flights at Newark even more than the FAA thought necessary mostly because it internalized more of the congestion externality than did all of the smaller carriers, not because it stood to gain the most from driving prices even higher.

Notwithstanding United's attempts to defend its behavior, the Division argued that United's strategy represented an exercise of market power and that further consolidation of the slots that were available to serve Newark would harm passengers. Below, we present the key facts that the Division pointed to in support of its allegations and consider potential counter-arguments.

4.2 Market Definition

First, we address the issue of whether slots at Newark are a distinct antitrust market. Newark, LaGuardia, and JFK are considered the three major airports for the New York City metropolitan area and therefore potential substitutes for each other. If

[36] In this article, our focus is on the under-utilization of slots that results from airlines' scheduling fewer flights than would be possible given their slot holdings. There will always be some deviation from scheduled operations—for example, from weather conditions that lead to flight cancellations—that are unrelated to the exercise of market power.

[37] Tracy Lee, United Vice President for Operations, quoted in Berger (2016).

slots at LaGuardia or JFK are equally attractive ways to provide air service to any particular destination, then questions about the concentration of slots at Newark raise fewer concerns.

Since slots are an input into the production of airline flights, the demand for slots derives from the demand for air service. Because a slot at Newark can be used to serve any destination, the relevant comparison should consider all of the demand for air service that involves Newark relative to the other New York City airports. To that end, air service from Newark can be considered a relevant antitrust market if—for the purposes of evaluating the proposed transaction—a monopoly provider at Newark (i.e., a monopoly owner of Newark slots) could profitably raise prices above the competitive level. This depends on how willing passengers are to substitute from Newark to the other major New York City airports.

As an initial matter, the Division found evidence that substitution from Newark to JFK or LaGuardia is costly, at least for some Newark passengers. Data on location of residence and airport choice showed that travel time is an important determinant of airport choice. As a result, Newark passenger demographics are significantly different from passenger demographics at JFK and LaGuardia. For example, more than half of passengers who depart from Newark came from New Jersey, whereas less than 10% of passengers who depart from JFK and LaGuardia came from New Jersey.[38] While not definitive, this evidence does suggest that some passengers might be reluctant to substitute away from Newark.

To be more definitive, the Division applied the Horizontal Merger Guideline's hypothetical monopolist test, which asks whether a profit maximizing hypothetical monopolist over a candidate market would raise fares by at least a small but significant and non-transitory amount (a SSNIP). There are many ways to evaluate this hypothetical. In this case, the Division took a reduced form econometric approach to evaluate how fares would change if all Newark service was provided by a monopolist.

Using a regression framework that is similar to Brueckner et al. (2013), the Division used data on historic fares, entry, and exit from the Department of Transportation's Origin and Destination Survey to estimate how changes in the competitive landscape at the three major New York City airports affect fares at Newark. Specifically, this analysis showed how changes in the number of airlines that serve a given destination from Newark, LaGuardia, and JFK affected Newark fares. The findings from this analysis were then used to calculate how Newark fares would change if all destinations from Newark were served by a single nonstop carrier (the hypothetical monopolist), holding fixed the number of competitors from LaGuardia and JFK. The Division concluded that such a monopolist would be able to increase Newark fares significantly despite competition from JFK and LaGuardia.

4.3 Monopoly Maintenance

At the heart of the Division's challenge was the allegation that United was already exercising substantial monopoly power at Newark airport. The increase in United's

[38] The Port Authority of NY & NJ, "2015 Airport Traffic Report". http://www.panynj.gov/airports/pdf-traffic/ATR_2015.pdf.

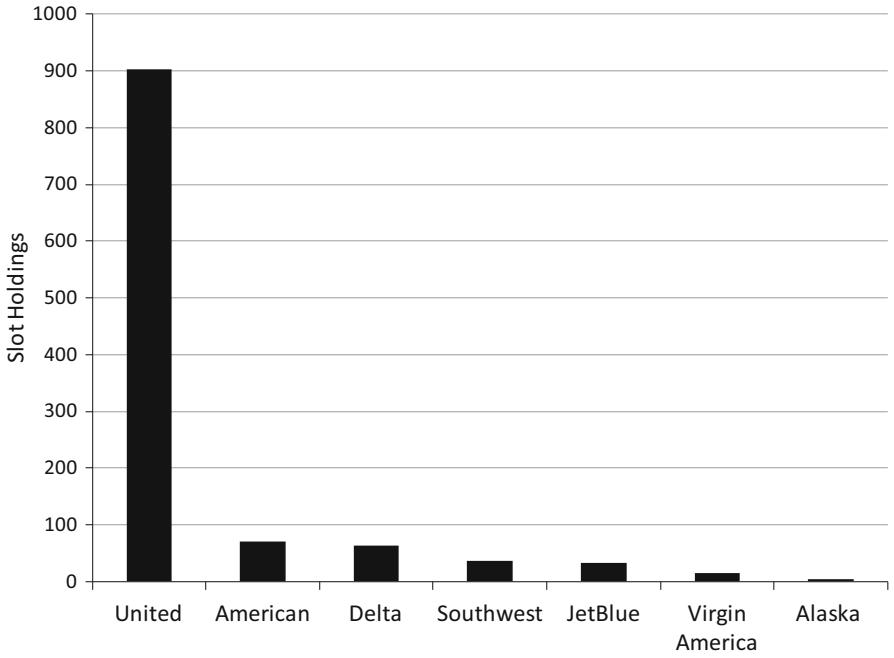

Fig. 2 United was the dominant slots holder at Newark Airport

slots share, from 73 to 75%, would have served to further entrench United as a monopolist at Newark and would have taken things from bad to worse.

A key fact that contributed to the Division's decision to block the transaction claim was the lopsided distribution of slots at Newark (Fig. 2). United controlled about 900 slots; American controlled 70 slots; and Delta controlled 64 slots. Concentration at Newark airport prior to the transaction was by far the highest of the three major New York City area airports. Pre-transaction HHI was about 2000 at JFK, about 3000 at LaGuardia, and 5440 at Newark—with the Newark HHI more than double the level that is considered to be highly concentrated in the Horizontal Merger Guidelines.[39] The transaction would have increased the Newark slots HHI by 270, a significant increase in concentration that is considered presumptively anti-competitive in the Horizontal Merger Guidelines.

The Division alleged that by further increasing the concentration of slot ownership, which is an essential input into providing Newark air service, the transaction would have harmed passengers who fly in and out of Newark airport. Indeed, the Division argued that these passengers were already being harmed by United's dominant position and that the transaction would serve to strengthen

[39] To construct the HHI for Newark, the Division calculated slot holdings with the use of FAA records of slot assignments and then adjusted those slot holdings with the use of documents on long-run sublease agreements that are not accounted for in the FAA records. Because complete long-run lease agreements for JFK and LaGuardia were not available to the Division, the HHIs for these airports were calculated from flight frequencies. The Newark HHI that is calculated from flight frequencies is 5367, which is very close to the slots-based HHI that is reported above.

United's grip. At the time of the Complaint, United was the monopoly nonstop carrier on 139 of the 206 destinations with any nonstop service from Newark.

The Division also cited the fare premium that was paid by Newark passengers relative to fares from JFK or LaGuardia to the same destination. Such a finding is consistent with both market power and a Newark-centric market definition. United argued that more benign factors—including higher costs at Newark airport and higher quality associated with United's expansive network out of Newark—completely explained the higher fares. However, their evidence did not rule out market power as a significant factor that explained the higher fares.[40]

The Division further supported its allegation of monopoly maintenance with evidence of United's under-utilization of slots. Figure 3 compares United's unused slots (in black) to other airlines' total slots holdings (in grey). United grounded more slots—about 80 each day—than any other airline had in its entire slots portfolio. The Division argued that this habitual under-utilization had the effect of limiting service at Newark: keeping out rivals who could have used those slots to compete; driving up fares; and harming consumers. Putting additional slots in the hands of a carrier that already had more slots than it cared to use could only exacerbate this problem. The Division determined that the harm to consumers caused by this transaction could not be outweighed by any new service that the transaction might enable.

United claimed that the transaction would allow it to add additional flights.[41] As the Division noted, however, the transaction did not change United's *ability* to add flights since they already had a large number of unused slots throughout the day. Therefore, the only relevant change was to United's *incentive* to add flights. By reducing Delta's flight schedule, the transaction might have induced United to add more flights to its schedule. On net, this cannot lead to an increase in service.

To the extent that United internalized the cost of congestion to a greater degree than did Delta, a slot in United's hands would be more likely to go unused relative to the same slot in Delta's hands. Similarly, United, as the dominant carrier, internalizes more of the fare erosion effects of increased supply, which provided an additional disincentive for United to expand service relative to Delta's use of the slots. Figure 3 suggests that the prospect of United's using the slots less intensively than Delta was a significant risk.[42]

[40] Consider, for example, the argument that Newark fares simply reflect higher network quality. Israel et al. (2013) find that average fares are higher at Newark than at LaGuardia and JFK, both with and without accounting for network quality.

[41] On United's post-transaction plans, see the Antitrust Division's Complaint in *U.S. v. United Continental Holdings, Inc., and Delta Air Lines, Inc.* (November 10, 2015): https://www.justice.gov/atr/case-document/file/792471/download.

[42] The Division also considered Delta's ability to adjust by flying outside of slot-controlled hours or by increasing the size of its jets to accommodate more passengers within slot-controlled hours. Even under the most optimistic scenario, this re-optimization could not fully eliminate the harm that would be caused by this transaction.

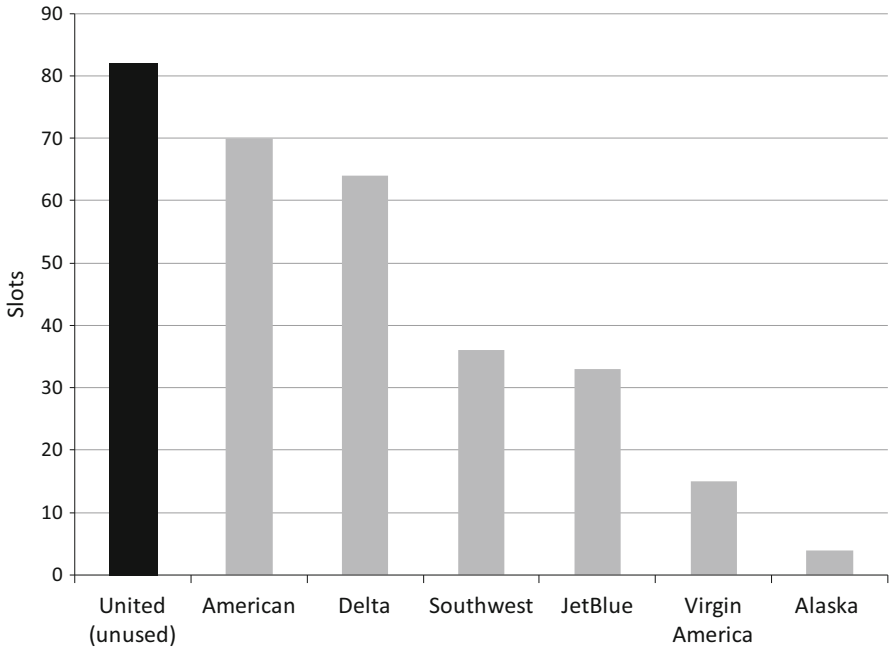

Fig. 3 United had more unused slots than any other airline's total slots

4.4 Other Anti-Competitive Effects

One immediate consequence of the transaction would be a sharp decrease in Delta's Newark slots portfolio. This reduction would equate to an equal reduction in the number of flights that Delta could offer in the slot-controlled window. Although Delta only served its hubs from Newark, it did so in direct head-to-head competition with United.[43] Even if Delta did not exit any routes, a reduction in flight frequency or change to less preferred flight times would degrade the quality of Delta's service and result in some loss of competition on these overlap routes. In addition to reducing competition on routes that were currently being served by Delta, the transaction would limit Delta's ability to enter new routes in response to changing market conditions.

The Division also argued that the transaction would have the effect of decreasing the probability of low-cost carrier ("LCC") entry that has been shown to reduce fares substantially. United, as the monopolist nonstop carrier on 139 routes, had more to lose from LCC entry than did Delta and would therefore be less likely to lease slots to an LCC. Thus, transferring slots from Delta to United would further limit the pool of slots that could potentially facilitate LCC entry.

Delta had demonstrated its willingness to lease slots to other carriers. For example, it was leasing slots to Porter Airlines: a small carrier that provided service

[43] The five destinations that Delta served from Newark were Atlanta, Cincinnati, Detroit, Minneapolis, and Salt Lake City. United also offered Newark flights to each of these destinations with the exception of Salt Lake City, for which Delta was the sole carrier.

to Toronto at the time of the proposed deal. Delta was also leasing slots to United at the time of the transaction. American Airlines, another legacy network carrier, had leased some of its Newark slots to low-cost carriers. To the extent that American's incentives were similar to Delta's (given their similar market shares at the airport), this fact could be interpreted as providing empirical support to the argument that Delta would be more likely to lease to LCCs than would United.

4.5 Conclusions

This investigation and litigation provided rich opportunities for analysis by Division economists. The fact that the transaction was specific to assets that were necessary to serve Newark airport created interesting market definition challenges, and meant that there was a need to determine whether air travel service from Newark was a separate market from air travel service from LaGuardia and JFK. The transaction also raised the novel defense that congestion management incentives of a dominant carrier should be viewed as an efficiency justification for an increase in market share by a monopolist.

The transaction was abandoned prior to trial when the FAA announced in April 2016 that, following its review of the data on Newark airport operations, Newark would no longer be a slot-controlled airport beginning in October 2016.[44] As a result of the elimination of slot controls, Allegiant Airlines announced that starting in late 2016 it will enter Newark and begin service to four destinations that were previously served by United.[45] JetBlue also announced plans to expand operations at Newark.[46] Even before the slot regime expired, United began to serve new destinations during summer 2016, including Bangor, Maine;[47] Lexington, Kentucky;[48] Fort Wayne, Indiana;[49] and Flint, Michigan.[50] How the end of the slot controls regime affects prices, competition, and congestion both at Newark and the other NYC airports will be an interesting topic for future research.

[44] Federal Aviation Administration, "FAA Announces Slot Changes at Newark Liberty International", April 1, 2016. https://www.faa.gov/news/updates/?newsId=85309.

[45] "Allegiant Air to Begin Offering Flights From Newark Airport", Wall Street Journal, June 28, 2016. http://www.wsj.com/articles/allegiant-air-to-begin-offering-flights-from-newark-airport-1467125620. These destinations are Asheville, North Caroline; Savannah, Georgia; Cincinnati, Ohio; and Knoxville Tennessee.

[46] Richard Newman, "United Airlines facing new competition at Newark International Airport", June 28, 2016, NorthJersey.com. http://www.northjersey.com/news/united-airlines-facing-new-competition-at-newark-international-airport-1.1623116.

[47] Nick McCrea, "United adding new seasonal flights between Bangor and Newark", *Bangor Daily News*, April 19, 2016. http://bangordailynews.com/2016/04/19/business/united-adding-new-seasonal-flights-between-bangor-and-newark/.

[48] Cheryl Truman, "United announces nonstop service from Lexington to Newark", *Lexington Herald Leader*, April 19, 2016. http://www.kentucky.com/news/business/article72623422.html.

[49] Fort Wayne-Allen County Airport Authority, "FWA and United Airlines Announce Nonstop Service", April 18, 2016. https://fwairport.com/news/fwa-and-united-airlines-announce-nonstop-service-to-new-york-newark.

[50] Dominic Adams, "United adding direct flights from Flint to Newark for NYC travel", mLive.com, April 19, 2016. http://www.mlive.com/news/flint/index.ssf/2016/04/bishop_airport_gets_non-stop_f.html.