Economics at the FTC: Deceptive Claims, Market Definition, and Patent Assertion Entities

Julie Carlson
Ginger Zhe Jin
Matthew Jones
Jason O'Connor
Nathan Wilson

Abstract: Economists in the FTC's Bureau of Economics (BE) perform a variety of economic analyses to support the Commission's missions to protect consumers and maintain competition. This analysis can impact important decisions via many avenues. This article describes examples where BE analysis has served as an input into a Commission investigation of deceptive claims, supported testimony in court proceedings in hospital mergers, and provided the empirical foundation for a study of immediate policy relevance on intellectual property.

Keywords: Antitrust, Consumer Protection, Deception, FTC, Intellectual Property, Mergers

Address for all authors but Jin:
Federal Trade Commission, Bureau of Economics
600 Pennsylvania Ave., N.W.
Washington, DC 20580, U.S.A

Address for Jin:
Department of Economics
University of Maryland
College Park, MD 20742

Acknowledgements: We thank Jonathan Cohen, Tim Daniel, Janis Pappalardo, Devesh Raval, Dave Schmidt, Andrew Stivers, Aileen Thompson and Michael Vita for helpful comments. The views that are expressed in this article are those of the authors and do not necessarily reflect those of the Federal Trade Commission or any of the individual Commissioners. Jin was the director of BE while much of this work was undertaken, but has now returned to her position at the University of Maryland.

Note: a final version of this paper was published in the December 2017 issue of the Review of Industrial Organization, (51:4), pages 487-513.

I. Introduction

The Bureau of Economics (BE) at the FTC provides economic analysis to support the FTC's two main missions: enforcing competition law, and protecting consumers. BE is composed of over 80 PhD economists, several accountants, and research and support staff. This article primarily discusses the work of the economists in BE. On investigations, economists work on teams with attorneys from our sister bureaus: the Bureau of Competition and the Bureau of Consumer Protection. However, BE provides independent assessments and recommendations to the Commission. Roughly two-thirds of BE economists work on competition matters, and the remainder are focused on consumer protection.

The decisions made by the FTC can have considerable economic impact. For example, FTC consumer protection and competition enforcement actions resulted in approximately $12 billion in redress and disgorgement in 2016[1] The FTC brought seventy consumer protection actions in 2016 covering a wide assortment of activities including: fraudulent money-making schemes; pay-day lending; deceptive or abusive debt collection; and imposter scams.[2] On the competition side, the FTC brought enforcement actions against twenty-two mergers in FY2016, which consisted of: sixteen consent orders that permitted the merger to proceed subject to certain conditions; five transactions in which the Commission filed a complaint in federal court to enjoin the transaction; and one that was abandoned or restructured during the investigation. Additionally, the FTC brought actions in six non-merger antitrust matters in FY2016, four of which were resolved with consent agreements.[3]

Research also constitutes a valuable and important activity for BE economists. Many of our economists engage in academic research in addition to their other professional duties, which results in BE working papers and journal publications. BE also contributes significantly to commission-wide studies and reports.[4] Additionally, BE highlights and disseminates competition-related research through seminars and conferences. We hosted our ninth annual FTC

[1] See https://www.ftc.gov/node/1205233. The majority of the welfare gains resulted from a settlement with Volkswagen in a false advertising matter discussed in more detail in the second section of this article.
[2] *Ibid*.
[3] See https://www.ftc.gov/competition-enforcement-database for a table of these merger and non-merger enforcement statistics for each year starting in 1996.
[4] For instance, see the FTC's 2017 retrospective study of merger remedies (https://www.ftc.gov/policy/studies/remedy-study) and our 2016 report on patent assertion entities (https://www.ftc.gov/policy/studies/patent-assertion-entities-pae-study), which is discussed in more detail in the fourth section of this article.

Microeconomics Conference in Washington, DC in November of 2016, which featured keynote speeches by our scientific committee of esteemed academic economists, policy-relevant panel discussions, and several paper sessions. We also co-organized the first Economic Conference on Marketing and Consumer Protection in September of 2016, joint with the academic journal of Marketing Science. Our weekly seminar series features research presentations, primarily of applied microeconomic research, by academic and government economists.

Each year, we use the opportunity presented by the Review of Industrial Organization's antitrust and regulation issue to offer a glimpse of the economic analysis performed by BE to an academic audience. This year, we present three examples.

The second section of this article describes a simple conceptual model that provides an economic approach to thinking about the consumer injury caused by deceptive claims about multi-attribute, differentiated products with significant resale value. In March of 2016, the FTC charged that the Volkswagen Group of America, Inc. (VW) deceived consumers in an advertising campaign to promote its supposedly "clean diesel" VWs and Audis, which VW fitted with emission defeat devices that masked high emissions during government tests (FTC 2016a). The conceptual framework laid out in this section could be used to understand the magnitude and nature of the harm from the deception as well as to evaluate the consumer impact of proposed remedies.

The third section evaluates various approaches to market definition in hospital mergers in light of the pivotal role that market definition played in court decisions on two recent FTC challenges of hospital mergers. In both cases, judges initially rejected the FTC's market definition; however, these decisions were reversed in Federal Circuit Court. This section describes the conceptual model used by the FTC to define antitrust markets in hospital cases, and discusses the alternatives offered by the merging parties in these two recent cases, with a focus on the economic properties of the various approaches.

The fourth section of this report discusses the empirical and economic analysis in the FTC's recent study (FTC, 2016c) of patent assertion entities (PAEs), which are defined as firms that primarily acquire patents and seek to generate revenue by asserting them against alleged infringers. As opposed to the two previous sections, the work described here is not motivated by a law enforcement objective. PAEs have attracted considerable attention in policy circles, although relatively little reliable information about the economic impact of these firms' business practices was

available, in part, due to the confidential nature of many of the licenses and settlements into which they enter. This study was able to overcome that problem, and shed light on the business practices of these firms, by obtaining confidential business information using authority granted us by the FTC Act in order to perform industry studies.

II. Consumer Injury in the Volkswagen Diesel Emissions Case

In 2016 and 2017, the FTC reached two separate settlements with Volkswagen over its claims that TDI diesel vehicles produced low levels of harmful emissions, when their actual emissions were many times larger than the legal limit. The FTC's complaint alleged that Volkswagen's claims were deceptive and unfair, causing substantial consumer injury. The settlements include a total of over $11.2 billion in potential payments to consumers in a redress program where eligible consumers can either sell their vehicle back to Volkswagen or keep it and get an emissions modification or repair if one is approved by regulators. All participating consumers receive thousands of dollars in cash restitution (FTC 2016b, 2017). This section discusses a general economic framework for thinking about consumer injury and redress in cases such as this one, where deceptive claims involve multi-attribute, differentiated products that retain significant resale value after purchase.

A. Overview of the Case and Consumer Settlements

From late 2008 and until late 2015, Volkswagen marketed and sold vehicles with TDI diesel engines in the United States and worldwide, claiming that their "Clean Diesel" technology made them an attractive option for consumers seeking an environmentally-friendly vehicle. The extensive marketing campaign featured slogans like "Diesel – It's No Longer A Dirty Word" and spread the message that TDI diesel engines "reduced nitrogen oxide (NOx) emissions by up to 90%," and had cleaner emissions than gasoline engines (FTC 2016a). Vehicles with TDI diesel engines include 2009-2016 models of the Volkswagen Beetle, Golf, Jetta, Passat and Touareg, as well as 2010-2016 models of the Audi A3, A6, A7, A8, Q5 and Q7, and 2013-2016 models of the Porsche Cayenne. The original retail prices of these vehicles ranged from $20,000-$25,000 for the base TDI Beetle, Golf and Jetta, to over $100,000 for a fully-equipped Audi A8 TDI or Porsche Cayenne Diesel (FTC 2016b, 2017).

Despite Volkswagen's clean emissions claims, in road tests of some TDI diesel vehicles Thompson et al. (2014) found that their emissions exceeded the EPA limit for NOx by a factor of 5 to 35. Volkswagen sold or leased more than 550,000 TDI diesels in the United States before it became public that these vehicles contained software that allowed their emissions to exceed EPA NOx limits under normal driving conditions. On September 18, 2015, the EPA publicly announced that approximately 475,000 2.0-liter TDI diesel vehicles exceeded NOx limits by up to a factor of 40 (EPA 2015a).[5] Volkswagen continued selling 3.0-liter TDI diesel vehicles until November 2, 2015, when the EPA announced that those vehicles also contained software allowing excess emissions up to a factor of 9 (EPA 2015b).[6]

The months following these announcements saw numerous lawsuits filed against Volkswagen. The FTC filed suit in March of 2016 alleging that due to the emissions testing "defeat device" installed in TDI diesels, claims made in Volkswagen's "Clean Diesel" marketing campaign violated Section 5 of the Federal Trade Commission Act's prohibition of unfair or deceptive acts or practices (FTC 2016a). By February of 2017, the FTC and Volkswagen had reached two settlements (separately for 2.0- and 3.0-liter vehicles) that include payments to consumers potentially totaling over $11.2 billion,[7] depending on whether Volkswagen can repair 2013 to 2016 models of 3.0-liter vehicles to bring them into full emissions compliance, and whether consumers choose a buyback or emissions modification for vehicles that cannot be brought to full emissions compliance. The emissions modification option, which would reduce vehicle emissions to near-compliance, but not full compliance, would only be available to consumers if it is approved by the EPA and the California Air Resources Board. If Volkswagen is unable to get an emissions repair or modification approved for any affected vehicles, it is required to buy those vehicles back from participating consumers (FTC 2016b, 2017).

The settlements provide thousands of dollars in cash restitution to vehicle owners, among other compensation, which the FTC concluded fully compensates them for injury caused by the alleged deception by Volkswagen.[8] Consumers participating in a vehicle buyback receive cash

[5] 2.0-liter TDI vehicles include the Volkswagen Beetle, Golf, Jetta and Passat and the Audi A3.
[6] 3.0-liter TDI vehicles include the Volkswagen Touareg, the Audi A6, A7, A8, Q5 and Q7, and the Porsche Cayenne.
[7] In addition to compensation from Volkswagen, total payments to consumers include approximately $275 million from Robert Bosch LLC, which was alleged to have developed the defeat device technology (FTC 2017).
[8] Other forms of consumer compensation provided by the settlements, but not detailed in this article, include loan forgiveness for vehicles sold back to Volkswagen, limited warranties for some vehicles receiving an emissions

compensation for surrendering their vehicle to Volkswagen in addition to cash restitution for injury, totaling to between $12,000 and $60,000 depending on the vehicle. Consumers participating in an emissions repair or modification receive cash restitution for injury, including the possible diminished value and reduced performance of the vehicle due to the repair or modification, totaling to between $5,000 and $18,000. The exact payment to each consumer varies depending on a number of factors tailored to the individual vehicle, such as the vehicle model, year, mileage, trim package and optional factory-installed equipment and features. In addition to redress for vehicle owners, lessees receive cash restitution of between $2,000 and $5,000, and a waiver of cancellation fees for early lease termination if a buyback is offered for owners of the same vehicles. The settlement also provides compensation to former owners who purchased their vehicles before and sold them after the truth about TDI diesel emissions was announced by the EPA, as these consumers would have absorbed the impact of this revelation on their vehicles' resale value (FTC 2016b, 2017).

B. Conceptual Framework for Redress of Consumer Injury

We now provide an overview of the general economic framework that guided FTC staff's analysis of consumer injury and the consumer redress provided by the Volkswagen settlements. The exact models used in this analysis remain confidential, as are the data and details of any empirical work. However, we believe that a high-level discussion of the key concepts is informative given that automobiles are a rather unique type of product in consumer protection economics. This is because automobiles are highly differentiated products with many attributes valued by consumers, they are expensive durable goods that retain a significant aftermarket resale value, and the processes of purchasing a vehicle or participating in a remedy involve substantial transaction costs to consumers. The conceptual model we describe here includes the main components involved in FTC staff's analysis up to a first-order approximation, though it is necessarily incomplete because many details of the case and FTC staff's analysis remain confidential.

The FTC's goal in the settlements was to compensate for consumer injury caused by the alleged deception. This involves comparing consumer surplus with the deceptive claims to consumer surplus in the counterfactual universe where product features are truthfully

---

modification or repair, and special protections for military members and consumers living in remote areas (FTC 2016b, 2017).

represented. Normally, we would consider counterfactual demand for the identical product, but without the deceptive claims. In this case, however, if the vehicles' emissions had been truthfully represented, U.S. regulators would have known that they were non-compliant, so they would not have been legal to market in the U.S. This means that in the counterfactual universe, all consumers would have bought a different vehicle, either an alternative existing vehicle, or possibly a different vehicle that Volkswagen might have produced instead of the TDI diesels with excessive emissions. Therefore, the consumer injury analysis involves comparing the *ex post* realized consumer surplus from driving the TDI diesels to the surplus consumers would have realized from driving the alternative vehicle purchased in the absence of Volkswagen's clean emissions claims.

The main components of consumer injury considered here include a) any price premium that consumers paid due to the clean emissions claims compared to an otherwise similar vehicle with regular emissions, b) the lost opportunity to avoid creating excess pollution by driving an emissions-compliant vehicle, c) for consumers who get an emissions repair or modification for their vehicle, compensation for reduction in vehicle performance or resale value due to the repair or modification, and d) any additional transaction costs imposed on consumers by the remedy. Though the dynamics of consumption utility are certainly important with automobiles, we present a simple static model that captures these main components and demonstrates in general terms how the buyback and emissions modification remedies provided by the settlements compensate for consumer injury. Economic analysis of the emissions repair remedy provided for 2013 to 2016 models in the 3.0-liter settlement would be similar to the analysis for the emissions modification, though with different amounts of consumer injury and cash compensation. This is because the emissions repair would bring vehicles into full emissions compliance with restrictions on vehicle performance effects, whereas the emissions modification would bring them to near-compliance without such restrictions.[9]

One might hypothesize that the clean emissions claims would have induced some consumers to pay more than they would have paid for a vehicle identical in all other attributes, but without the clean emissions claims. Of course, there may be other reasons for price

[9] The 3.0-liter settlement requires Volkswagen to repair 2013-2016 models of 3.0-liter TDI diesels without diminishing fuel economy more than 3 MPG, torque more than 5%, or horsepower more than 5%. The FTC order requires Volkswagen to pay additional compensation to consumers if performance effects of the repair exceed these limits, and if they exceed these limits significantly, a buyback may be triggered. (FTC 2017).

differences between the TDI diesel and the vehicle consumers would have purchased absent the clean emissions claims: the counterfactual alternative vehicle may differ from the TDI diesel in more than one attribute, and different competitive conditions affecting prices might have prevailed in the counterfactual market. However, for the purposes of this exposition, we assume that the alternative vehicle is one that is identical to the TDI diesel in all attributes, except with regular, compliant emissions. We denote the original retail prices for the TDI diesel and the alternative vehicle by p_D and p_A, respectively.

Consumers who value clean emissions were further injured by being induced to purchase a vehicle producing extra-dirty emissions rather than an emissions-compliant alternative. The utility from consuming the vehicles was derived over time, and before the truth was revealed, part of the utility consumers expected and enjoyed was from the belief that the vehicles produced low emissions levels. When this belief turned out to be false, the utility related to environmental-friendliness would turn to disutility from creating excessive pollution, and many consumers would regret not having driven a different vehicle that polluted less.[10] We denote the *ex post* realized consumption utility that consumers have derived from the TDI diesel and the alternative vehicle that they would have purchased absent Volkswagen's clean emissions claims by u_D and u_A, respectively.

Because they are durable goods with significant asset value, we must consider the current resale value of the alternative vehicle, denoted by R_A, and the resale value of TDI diesel at three important points: just before truth about TDI diesel emissions was revealed, denoted by R_D^{PRE}, just after the truth was revealed but before the vehicle has received an emissions modification, denoted by R_D^{POST}, and just after the vehicle receives an emissions modification, denoted by R_D^{EM}. For the purposes of this exposition, we make the simplifying assumption that the resale values also represent the residual consumption utility of these vehicles to owners who keep them and exhaust their useful life.[11]

We also consider the transaction costs of participating in the remedy, be that a buyback or an emissions modification. Transaction costs involved in a buyback, denoted by t_{BB}, may include the cost of searching for a replacement vehicle, the "shoe leather" or time and nuisance cost of

[10] How to model formally the dynamics of consumer utility under false beliefs about credence attributes of the product purchased, and the effect of revealing those beliefs as false, is an interesting theoretical question. Though it deserves a more thorough treatment, we do not attempt to provide that in this brief overview.

[11] This is a conservative assumption, as owners choosing to keep the vehicles would expect the dollar value of their residual consumption utility to exceed the vehicles' resale value.

participating in the buyback and completing a replacement vehicle purchase, taxes and fees for the replacement vehicle, etc. Transaction costs involved in an emissions modification, denoted by t_{EM}, may include the time and nuisance costs involved in getting the modification completed at a dealership, any additional maintenance issues that might arise due to the modification, etc.

Before any remedy is applied, consumer surplus can be expressed as the difference between a) the *ex post* realized utility from driving the vehicle to date, and b) the original price paid for the vehicle less its current resale value, or the net price the consumer paid for the part of the vehicle's value they have consumed to date. Consumer injury is then equal to the difference between consumer surplus from the alternative vehicle purchased absent clean emissions claims about TDI diesels ($u_A - (p_A - R_A)$) and the *ex post* realized consumer surplus from the TDI diesel ($u_D - (p_D - R_D^{POST})$). This difference can be rewritten as the sum of the price premium associated with the clean emissions claims, $p_D - p_A$, the additional opportunity cost of driving a vehicle with excessive emissions compared to an emissions-compliant alternative, $u_A - u_D$, and the difference in resale value between the alternative vehicle and the TDI diesel, $R_A - R_{\mathrm{D}}^{\mathrm{POST}}$:

$$Injury = p_D - p_A + u_A - u_D + R_A - R_D^{POST}. \quad (1)$$

The additional opportunity cost term, $u_A - u_D$, is necessary for a full estimate of consumer injury because the full disutility from having caused excessive, non-compliant emissions would not be reflected in the price difference between the TDI diesel and the alternative emissions-compliant vehicle the consumer would have purchased in the counterfactual universe. As mentioned above, the vehicle with excessive, non-compliant emissions would be illegal in the counterfactual universe where emissions are represented truthfully. The price premium, $p_D - p_A$, captures injury only to the extent that it is reflected in the difference in the prices paid for a vehicle claimed to have clean emissions and an alternative with regular, compliant emissions.

We now consider the effects of two remedies: a buyback and an approved emissions modification.[12] A buyback requires the consumer to return the vehicle worth R_D^{POST} in order to receive a cash compensation amount, $Comp_{BB}$. Buyback consumers incur transaction costs, t_{BB}, in order to participate in the buyback and obtain a replacement vehicle. One way to define a buyback cash compensation amount would be as the sum of 1) the TDI diesel's resale value just

[12] As mentioned above, the economic principles in an approved emissions repair remedy would be similar to those of the approved emissions modification, though the magnitudes of each component may differ.

before the truth was revealed, 2) the clean emissions price premium on the depreciated portion of the vehicle's market value,[13] 3) the additional opportunity cost of having driven a vehicle with excessive emissions, and 4) the buyback transaction costs. This is represented by the following equation:

$$\boldsymbol{Comp_{BB}} = \boldsymbol{R_D^{PRE}} + \frac{\boldsymbol{p_D - p_A}}{\boldsymbol{p_D}}\left(\boldsymbol{p_D} - \boldsymbol{R_D^{PRE}}\right) + \boldsymbol{u_A} - \boldsymbol{u_D} + \boldsymbol{t_{BB}}. \qquad (2)$$

For the purposes of this exposition, we add the simplifying assumption that the market value of the TDI diesel and the alternative vehicle would have depreciated at the same rate from the original purchase until the present, i.e., we assume that $\frac{R_A}{p_A} = \frac{R_D^{PRE}}{p_D}$ holds. Under this assumption, it is easy to show that the effect of the buyback on consumer utility, $Comp_{BB} - R_D^{POST} - t_{BB}$, fully compensates for consumer injury as specified in Equation (1).

Note that Equation (2) is written such that $Comp_{BB}$ is equal to the resale value of the TDI diesel just before the truth about their emissions was revealed, R_D^{PRE}, plus other compensation including, among other things, the clean emissions price premium on the depreciation of the vehicle up to that time, $\frac{p_D - p_A}{p_D}(p_D - R_D^{PRE})$. This demonstrates a shortcut to calculating $Comp_{BB}$ and reducing the degree to which this calculation relies on empirical estimation, assuming that reliable information on resale values is readily available, and that the clean emissions price premium continued to be reflected in the vehicle's resale prices up to the time when the truth was revealed. By returning R_D^{PRE} to the consumer, the buyback automatically compensates for the cost of a replacement vehicle that is otherwise similar but without the clean emissions claims, plus the portion of the original clean emissions price premium that was still expressed in resale value R_D^{PRE}. Full compensation for the price premium then requires adding only the estimated portion of the price premium that depreciated from the vehicle's resale value between the original purchase and the time when the truth was revealed.

An emissions modification requires the consumer to incur transaction costs, t_{EM}, in order to receive a cash compensation amount, $Comp_{EM}$, and to have her vehicle's emissions modified to near-compliance such that its resale value changes from R_D^{POST} to $R_D{}^{EM}$. One way to define an emissions modification cash compensation amount would be as the sum of 1) the clean emissions

[13] More precisely, the clean emissions price premium is expressed as a percentage of the TDI diesel's original purchase price, multiplied by the depreciation of the TDI diesel between the original purchase and just before the truth was revealed

price premium, 2) the additional opportunity cost of having driven a vehicle with excessive emissions, 3) the difference in resale value between the alternative vehicle and the modified TDI diesel, and 4) the emissions modification transaction costs. This is represented by the following equation:

$$\boldsymbol{Comp_{EM} = p_D - p_A + u_A - u_D + R_A - R_D^{EM} + t_{EM}.} \quad (3)$$

It is straightforward that the effect of the emissions modification on consumer utility, $Comp_{EM} + R_D^{EM} - R_D^{POST} - t_{EM}$, fully compensates for consumer injury as specified in Equation (1).

Aside from the objective of obtaining full compensation for injury in either of the two remedy scenarios discussed above, buyback provisions in the Volkswagen settlements have the additional feature of consumer choice: owners of vehicles that cannot be repaired to full emissions compliance can choose to participate in either the buyback or emissions modification, if a modification is approved. This mechanism has a self-sorting property such that consumers most disappointed by the emissions claims or most concerned about the effects of the modification can return their vehicles, while consumers who are less concerned about these things or who value their TDI diesels for other reasons can choose to keep them. In either case, consumers receive cash restitution for injury caused by the clean emissions claims. Due to the heterogeneity in consumer preferences that is likely to exist and the difficulty of tailoring the remedy to suit each individual consumer, this self-sorting property improves the ability of the remedy to fully compensate each individual consumer.

C. Conclusion

The simple conceptual model described above demonstrates a way of thinking about the consumer injury caused by deceptive claims about multi-attribute, differentiated products with significant resale value, as well as some ways to remedy this injury. The same general framework guided FTC staff's analysis in the Volkswagen case, and though the details of this analysis remain confidential, we hope that this section provides some insight into the economic principles involved.

III. Market Definition in Hospital Merger Investigations

In 2016, the Federal Trade Commission (FTC) challenged two proposed hospital mergers. The first transaction was between the Penn State Hershey Medical Center (Hershey) and PinnacleHealth System (Pinnacle).[14] The second was between Advocate Health Care Network (Advocate) and NorthShore University HealthSystem (NorthShore).[15] In both cases, Federal District Court judges initially ruled against the FTC, denying the agency preliminary injunctions that would prevent the transactions' consummation prior to a full hearing of the facts in administrative court. However, both of these decisions were reversed in Federal Circuit Court. Both sets of parties chose to abandon their transactions after the FTC were awarded preliminary injunctions.

The contexts of the two proposed mergers differed significantly. Hershey-Pinnacle involved hospital systems located close by in a comparatively isolated area. In contrast, Advocate-Northshore would have combined two systems operating in the same part of a densely populated city. Notwithstanding these differences, the FTC first lost, and then won, both cases based on how it defined the relevant set of competitors and competition. In other words, the cases turned on "market definition" (Baker & Bresnhan, 2008; Baker J. B., 2007; Davis & Garces, 2010).

Especially when coupled with previous Circuit opinions on matters such as St. Luke's, Promedica, and OSF Rockford, these recent cases affirm and support the approach taken by the FTC in analyzing competition between horizontally differentiated health care providers.[16] In this section, we describe the overarching conceptual model used by the FTC to define antitrust markets in hospital cases, paying special attention to the issue of geography, which has been especially contentious.[17]

---

[14] For details, see https://www.ftc.gov/enforcement/cases-proceedings/141-0191/penn-state-hershey-medical-centerpinnaclehealth-system.

[15] For details, see https://www.ftc.gov/enforcement/cases-proceedings/141-0231/advocate-health-care-network-advocate-health-hospitals.

[16] The Massachusetts State Supreme Court's opinion on Partners also broadly supports this approach insofar as it is consistent with the approach taken by the Massachusetts Health Policy Commission (http://www.mass.gov/anf/docs/hpc/20140219-final-cmir-report-phs-ssh-hmc.pdf, as accessed July 19, 2017), which influenced the judge's decision-making (http://www.mass.gov/ago/docs/press/2015/partners-memo-of-decision-and-order.pdf, as accessed July 19, 2017).

[17] The cases have occasioned other recent commentary, which may be of interest to some readers. See, e.g., the collection of articles published by *Competition Policy International* (https://www.competitionpolicyinternational.com/antitrust-chronicle-healthcare-mergers-a-post-mortem/, as

A. Background of Market Definition

The approach that the antitrust agencies take to evaluating horizontal mergers is laid out in *The Horizontal Merger Guidelines (Guidelines)* (2010).[18] The *Guidelines* state that the process of market definition is used to "specify the line of commerce and section of the country" that may be affected by a given transaction or practice (§ 4). This enables the interested parties "to identify market participants and measure market shares and market concentration" (§ 4). While raw measures such as the number of relevant competitors and their respective market shares do not determine whether an agency will challenge a transaction, let alone whether it will win in court, case law and custom mean that the outputs of the market definition process continue to serve an important role in litigation and courts' decision-making.[19] Therefore, both the plaintiffs (i.e., the FTC) and the defendants (i.e., the merging parties) devote considerable attention to the question.

The *Guidelines* advise that antitrust markets are defined by engaging in a specific thought exercise, the "Hypothetical Monopolist Test" (HMT). The idea is to identify the set of products and offering firms that a hypothetical monopolist would need to control in order to achieve a "small but significant and non-transitory increase in price" (SSNIP).

In practice, antitrust market definition involves both a product and a geographic dimension. The difference between these components is that product market definition clarifies what products or services may be affected by aligning the parties' incentives, while geographic market definition focuses on the geographic area potentially affected by the merger. The latter is determined by customers' willingness and ability to switch to geographically differentiated firms offering products or services in the relevant product market.

When confronted with a situation in which the merging parties engage in differentiated product competition, meaning that consumers choose among products that differ on multiple dimensions and not just price, the question is which competitors and which products should be included and which should be excluded from the relevant market. On the one hand, one should

---

accessed July 19, 2017). A piece advancing a very different perspective also recently appeared in the *Antitrust Source* (Field, Fisher, & Coglianese, 2017).

[18] Although not carrying the force of law, the *Guidelines* have been widely adopted by courts as the appropriate lens through which to evaluate whether or not a given transaction conflicts with the antitrust laws.

[19] For example, see some of the citations in footnote 4 of Baker (2007). The relative importance of market definition has become controversial. For details, see inter alia the dialogue between Louis Kaplow (2014; 2010) and Greg Werden (2013; 2014). For context on the role of market definition in litigation vs. the investigation, see, e.g., Tenn (2017).

be leery of excluding too many potential substitutes and thereby defining too narrow a market. All else equal, this would tend to lead to inaccurately high estimates of market concentration and over enforcement. However, one should not respond to this possibility by erring in the opposite direction and including too many competitors' firms or products. While including many competitors could accurately reflect that *some* customers may turn to any one of a number of competitors in a market, it may often miss the fact that *many* customers have strong preferences about a more narrow set of options. This would tend to result in inappropriately low estimates of market concentration and under enforcement.

In litigation, the merging parties tend to argue that the FTC has defined the market too narrowly, which gives the mistaken impression that a transaction could be anticompetitive. In contrast, the FTC often contends that the parties' market definition conflates fringe with core competitors, leading to an underestimate of the loss in competition from the transaction.

B. Market Definition for Hospital Markets

Defining the relevant product market for hospital mergers is *generally* uncontroversial. This is because it is usually impossible to argue that there are services available outside of hospitals that are substitutable for those provided inside them, especially with respect to inpatient (i.e., requiring at least one overnight stay) care.[20]

The appropriate analytical approach to identifying a geographic market for hospital services tends to be more controversial and has been discussed for many years. In the 1980s, a sharp uptick in health care provider consolidation – perhaps prompted by the broader shift toward managed care[21] – led to a number of articles focusing on how antitrust practitioners might consistently address the issue.[22] These contributions advocated tools consistent with how antitrust markets for other products were being defined around this time.

In particular, these early articles justified the usage of "flow" measures associated with the modeling framework of Elzinga and Hogarty (1978; 1973). According to this approach, a

[20] The largest possible disagreement tends to be whether it is appropriate to define a "cluster market" of all inpatient services as opposed to taking a more piecemeal approach that identifies different markets for separate service lines. Obviously, different service lines are not substitutable for patients. However, if broadly similar competitive conditions and broadly similar barriers to entry exist across the different constituent elements of the cluster, the analytical convenience of a single market is attractive. For discussion of cluster markets, see inter alia Ayres (1985) or Baker (2007).

[21] For some additional details and citations on this subject see, inter alia, Dranove, Shanley, and White (1993) and Dranove (2012).

[22] See, for example, Baker (1988).

properly defined geographic market is one with comparatively little outflow (i.e., 75% or more of consumers within a candidate area purchase from sellers within that area) as well as little inflow (i.e., 25% or fewer of sales are made to consumers located outside the area). These flow measures tend to be used to define markets by atheoretically coupling them with the "critical loss analysis" approach of evaluating whether a price increase would lead to sufficiently many lost sales as to make the increase unprofitable.[23] For example, an analyst might use evidence of significant outflows (inflows) to argue that the merging firms could not raise their prices without losing too many sales to be profitable.

The Department of Justice successfully challenged the merger of Rockford Memorial Hospital and SwedishAmerican Hospital in 1989 using the Elzinga-Hogarty/Critical Loss approach to define the market.[24] This victory soon proved pyrrhic, however, for the Elzinga-Hogarty/Critical Loss methodology relies on assumptions that make it prone to underestimating the intensity of local competition in hospital markets.[25] This problem revealed itself rapidly in the wake of the Rockford Memorial case as the federal antitrust agencies lost cases repeatedly through the 1990s as courts concluded that the relevant set of competitors was large.[26]

The key underlying problems with using patient flows to define hospital markets are as follows.[27] First, in any given area, it is commonplace for some patients to choose to travel for hospital care even though a majority of patients does not.[28] Because the "travelling" patients' insurance plans mean that their out of pocket expenses largely do not differ across hospitals, price is not the primary driver of their willingness to travel. Therefore, outflows and inflows are

[23] There is a rich (and critical) literature on "critical loss." See, in particular, Katz and Shapiro (2003) and O'Brien and Wicklegren (2003).
[24] The defendants also embraced the Elzinga-Hogarty methodology, though their own analysis led to a significantly broader market. Ultimately, the court ruled that the government's implementation was more correct, and found a comparatively small market in which the combined firm would likely be able to exercise considerable market power. See opinion at http://law.justia.com/cases/federal/district-courts/FSupp/717/1251/1584207/ (accessed June 27, 2017) or Capps (2014).
[25] Davis & Garces (2010), Ch. 4.5. This point is so well-accepted by economists that Ken Elzinga himself published an academic article stating that it should not be used to define health care markets (Elzinga & Swisher, 2011).
[26] Details on this history of failure are recounted in Capps (2014).
[27] This recognition emerged out of two parallel trends. Inside academia, new thinking led to the development of analytical paradigms that better fit the institutional characteristics of hospital markets (Capps, Dranove, & Satterthwaite, 2003; Town & Vistnes, 2001). Meanwhile, the FTC itself was engaged in a project to retrospectively assess multiple consummated hospital transactions (Farrell, Pautler, & Vita, 2009). More discussion on this history is available in a variety of articles (Garmon, 2015; Capps, 2014).
[28] This has come to be referred to as the "silent majority" fallacy (Capps, Dranove, Greenstein, & Satterthwaite, 2001).

not a reliable guide to how patients would respond to a change in the price hospitals charge their insurer.

Second, the nature of the Elzinga-Hogarty flow approach does not match the institutional characteristics of hospital markets. Fundamentally, the focus on flows presumes that all patients are homogeneous. Such an assumption may make sense when thinking of commodity markets (Davis & Garces, 2010, pp. 199-200). However, health care is quite different. The fact that some consumers are willing to travel does not mean that many more would travel in response to a modest price increase. Even if there are medical needs for which some given set of patients know they would choose to travel, they very likely will also place great value on the option of accessing a local hospital for other types of care.

Consistent with the theoretical flaws described above, scholarly work has tended to show that the flow-based approach leads to geographic markets that are too broad (Gaynor, Kleiner, & Vogt, 2013). In other words, the available evidence suggests that focusing on patient flows produces geographic markets that include hospitals that exert little competitive discipline on the merging parties and leads to an underestimate of the change in market share from the merger (Capps, 2014).

Instead of Elzinga-Hogarty, the modern approach to defining geographic markets emphasizes the role of the insurer as the relevant purchaser of hospitals' services.[29] Insurers market plans that are multidimensional in character. Key characteristics include the breadth of their provider network and the magnitude of their premiums. In general, these two things are in tension. To have all providers in network, an insurer may have to offer higher reimbursement rates that lead to higher insurance premiums. In contrast, a narrow network product that excludes some hospitals may enable the insurer to negotiate lower rates. While differences in reimbursement rates are ultimately born by individual patients via premiums or compensation, the patients do not observe individual hospitals' prices at any point.

These insights lead to the key market definition question: what set of hospitals if owned by a hypothetical monopolist would be so desirable that it would be commercially preferable for an insurer to pay higher reimbursement rates rather than market a cheaper, narrower network that excluded all of the hospitals in the hypothetical set. To answer this, the antitrust agencies rely on

[29] For a full treatment on how health care markets are treated in modern industrial organization, see Gaynor, Ho, and Town (2015).

a combination of quantitative analyses (e.g., structural demand estimation and merger simulations) and qualitative assessments (e.g., insurer testimony, ordinary course documents). The respective importance of any one type of evidence will vary depending on any individual case's specific details.

C. Market Definition in Hershey-Pinnacle and Advocate-NorthShore

In both Hershey-Pinnacle and Advocate-NorthShore, the product market portion of market definition was comparatively uncontroversial. During litigation, no economic expert questioned that the parties provided general acute care inpatient (GAC) services. Similarly, neither side's economic experts argued that things like outpatient care were sufficiently close substitutes to prevent a hypothetical monopolist controlling all providers of GAC services from increasing prices by a SSNIP.[30] Instead, the key market definition question was geographic. What was the extent to which the different parties overlapped with each other in local hospital markets, and who were the other hospital systems constraining their pricing?

In Hershey-Pinnacle, the FTC ultimately defined the geographic market as those hospitals located within a four-county area around the city of Harrisburg. To support this market definition, the FTC cited to a variety of evidence. This included econometric estimates of extremely high diversion ratios – i.e., the fraction of consumers who would go to one party if denied access to the other – between just the merging parties themselves.[31] Substantiating the data work were many details, including descriptive statistics showing Harrisburg area residents' overwhelming preference for local providers[32] as well as qualitative evidence like statements from insurers saying that they would rather pay much higher rates than lose the combined system from their providing network.[33] Corroborating the payers' fears was the example of an insurer, which lost the majority of their members when Pinnacle exited their narrow network product,

[30] For example, the initial opinion of the District Court judge for the Advocate case notes that the defense expert concurs with the FTC's product market definition (https://www.ftc.gov/system/files/documents/cases/2016.20.16_ecf_no_485_redacted_opinion_and_order.pdf, as accessed on July 18, 2017), p. 5. See also Tenn (2017). For Hershey-Pinnacle, the Third Circuit states that "There is no dispute as to the relevant product market" (https://www.ftc.gov/system/files/documents/cases/160927pinnacledecision.pdf, as accessed July 19, 2017), p. 14.
[31] Administrative Complaint (https://www.ftc.gov/system/files/documents/cases/151214hersheypinnaclecmpt.pdf as accessed June 28, 2017), ¶ 40.
[32] Brief of the Federal Trade Commission and the Commonwealth of Pennsylvania Before the U.S. Court of Appeals for the Third Circuit (https://www.ftc.gov/system/files/documents/cases/160601pinnacleappealbrief.pdf as accessed June 28, 2017), p. 10.
[33] Opinion of the United States Court of Appeals for the Third Circuit (https://www.ftc.gov/system/files/documents/cases/160927pinnacledecision.pdf as accessed June 28, 2017), p.28.

which had already excluded Hershey.[34] Taken together, the FTC argued that such evidence supported the conclusion that a hypothetical monopolist that controlled not just the parties' hospitals but also all those of rival systems in the four county area would have been able to demand at least a 5% increase in their reimbursement rates, i.e. a SSNIP.

The approach that the FTC took in Advocate-NorthShore was thematically similar insofar as it too focused on the merger's impact on insurers. In that case, the FTC defined the market as the "North Shore Area," which was the region in the northern part of Chicago "bounded by six GAC inpatient hospitals: NS Evanston, Swedish Covenant Hospital, Presence Resurrection Medical Center, Northwest Community Healthcare Hospital, Advocate Condell, and Vista Medical Center East."[35] Supporting this definition, the FTC was again able to point to direct evidence of competitive effects driven by the parties' substitutability and patients' high preference for local options.[36] Moreover, a formal merger simulation based on this market definition showed that a hypothetical monopolist in control of all eleven hospitals in the market would be able to profitably increase prices.[37] Once more, the conclusions were supported by testimony from insurers indicating that they would be unable to market plans excluding both Advocate's and NorthShore's hospitals.[38]

In both cases, the parties argued that the FTC's approaches mistakenly led to geographic markets that were too narrow. Although their conclusion was the same, the facts that the merging parties emphasized differed across the two cases.

In Hershey-Pinnacle, the parties emphasized that a high proportion of Hershey's patients came from outside the four county area.[39] This was taken as evidence that some non-trivial fraction of these patients would divert to alternative hospitals in the event of a price increase, making the price increase unprofitable. In short, the merging parties advanced a classic example

---

[34] Opinion of the United States Court of Appeals for the Third Circuit (https://www.ftc.gov/system/files/documents/cases/160927pinnacledecision.pdf as accessed June 28, 2017), p.29-30.
[35] Administrative Complaint (https://www.ftc.gov/system/files/documents/cases/151218ahc-pt3cmpt.pdf, as accessed June 28, 2017), ¶ 23.
[36] Administrative Complaint (https://www.ftc.gov/system/files/documents/cases/151218ahc-pt3cmpt.pdf, as accessed June 28, 2017), ¶ 40-43.
[37] Opinion of the United States Court of Appeals for the Seventh Circuit (https://www.ftc.gov/system/files/documents/cases/161101advocate_ca7_opinion.pdf, as accessed June 28, 2017), p. 6.
[38] Opinion of the United States Court of Appeals for the Seventh Circuit (https://www.ftc.gov/system/files/documents/cases/161101advocate_ca7_opinion.pdf, as accessed June 28, 2017), p. 4.
[39] Pinnacle District Court Opinion, p. 9.

of the Elzinga-Hogarty/Critical Loss argument in order to define a broad market. This conclusion ignores the fact that the willingness of some patients outside of the Harrisburg area to seek care at Hershey provides no insight into whether or not an insurer offering plans to local residents would be able to do so without either Hershey or Pinnacle. Similarly, no evidence was presented that these patients' choices were made on the basis of price.

Notwithstanding the disjunction, the District Court found the parties' argument compelling. Indeed, it stated that the FTC's market definition failed because it was not one where "'few' patients leave … and 'few' patients enter."[40] In other words, the Court explicitly embraced the Elzinga-Hogarty framework in denying the FTC a preliminary injunction.

In Advocate-NorthShore, the parties pointed to a different fact pattern to argue that the relevant geographic market was broader than defined by the FTC. However, instead of focusing on the behavior of patients living outside the geographic market as in Hershey-Pinnacle, the merging parties' advocacy emphasized those within it. Specifically, they focused on evidence showing that a substantial number of patients within the area would choose to receive care at hospitals other than those within the FTC's geographic market if the merging parties were unavailable. They argued that this implied that the relevant market was broader than the FTC defined.[41] Although somewhat more nuanced than the argument put forward in Hershey, this argument too reflected another example of the faulty logic inherent in applying Elzinga-Hogarty to hospital markets. Specifically, in focusing on the behavior of a subset of patients willing to travel, it ignored the central question of whether or not a hypothetical monopolist in control of all the hospitals within the market would be able to extract a SSNIP from insurers.

Once more, the District Court found the parties' advocacy persuasive, judging that the criterion used to include and exclude hospitals from the market lacked an economic basis.[42] As a result, the judge denied the FTC's petition for a preliminary injunction.

On appeal, the FTC challenged both District Courts' reliance on outmoded approaches to defining geographic markets. In so doing, the FTC was aided by amici curiae briefs signed by

[40] Pinnacle District Court Opinion, p. 10.
[41] Amended Memorandum Opinion and Order of the United States District Court (https://www.ftc.gov/system/files/documents/cases/2016.20.16_ecf_no_485_redacted_opinion_and_order.pdf, as accessed June 28, 2017), p. 9.
[42] For more discussion of the District Court's concerns, see, inter alia, Gaynor and Pflum(2017).

many leading health and industrial organization economists, including Ken Elzinga.[43] These briefs echoed the FTC's own statements in emphasizing the relevant role of insurers as purchasers of hospitals' services and the inappropriateness of concluding that patient flow evidence could be taken as evidence of patients' sensitivity to hospitals' reimbursement rates.

In both cases, the Circuit Courts rejected the District Courts' conclusions, emphasizing that the lower court judges had committed error in their application of the hypothetical monopolist test. The Third Circuit specifically cited to a host of strong qualitative evidence to judge that the District Court had committed an error in its application of the hypothetical monopolist test in Hershey-Pinnacle. It directed the lower court to grant the preliminary injunction. In overruling the Advocate decision, the Seventh Circuit cited insurer statements as well as evidence from merger simulations to conclude that the District Court's dismissal of the FTC's definition was ill-founded. Upon remand, the District Court ultimately found that the FTC's market definition in Advocate-NorthShore was reasonable, and granted it the preliminary injunction.

D. Conclusion

Looking ahead, one might wonder what consequences the FTC's string of victories will have. It seems reasonable to hope that analytical methods clearly at odds with the economic realities of hospital markets will be abandoned.

However, even if this proves correct, the antitrust agencies and merging providers will still find ample grounds over which to disagree. This is because the average consequences of some hospital merger-related issues remain unsettled in both theory and evidence. Moreover, even if there were confidence in the average implications, one might reasonably expect outcomes to be heterogeneous at the transaction level. Similarly, even if there is good evidence about the average accuracy of different types of hospital demand model (Raval, Rosenbaum, & Wilson, 2015), every hospital market is different and the industry is in flux. Moreover, new techniques are being developed that may overturn the existing conventional wisdom (Ghili, 2017; Liebman, 2017; Raval, Rosenbaum, & Wilson, 2017).

[43] Advocate Amicus (http://www.modernhealthcare.com/assets/pdf/CH106265726.PDF, as accessed July 19, 2017) and Pinnacle Amicus (http://www.hbs.edu/faculty/Profile%20Files/Amicus%20Brief%20in%20re%20Hershey-Pinnacle%20Proposed%20Merger%206.2016_e38a4380-c58b-4bb4-aecd-26fc7431ecba.pdf, as accessed July 19, 2017).

IV. Patent Assertion Entity Study

The FTC undertook the Patent Assertion Entity Activity study to provide a detailed, empirical picture of the patent assertion entity (PAE) business model for policymakers, firms, and researchers interested in their operations (FTC 2016c).[44] In 2012, the FTC and the Department of Justice hosted a joint workshop on PAEs in which a number of workshop attendees highlighted the lack of empirical evidence on a number of important questions about PAEs.[45] In particular, while a literature around PAEs has developed, most of these studies rely only on publicly available data sources such as litigation records and patent transfer records.[46] PAE patent license agreements are typically confidential and subject to non-disclosure agreements. Consequently, few empirical studies include analyses of PAE license agreements. The FTC used its authority under section 6(b) of the FTC Act, which grants the agency the authority to conduct industry studies and to compel production of confidential business information as part of these studies, to undertake its study of PAE activity.[47]

The study produced numerous empirical facts on PAE business organization, assertion behavior, and patent holdings.[48] Our discussion in this paper focuses on the key finding that the PAEs in the study followed one of two distinct business models: Litigation PAEs and Portfolio PAEs. Litigation PAEs are typically entities started with little capital that acquire patents through contingency payments and rely on litigation to reach license agreements covering less than 10 patents. Portfolio PAEs are well-capitalized entities, staffed by executives with licensing experience that typically acquire patents with fixed, up-front payments and reach license agreements covering hundreds or thousands of patents. The differences between the two types have important implications for the potential effects of any policies directed towards PAE activity.

After detailing the stratified sampling algorithm the FTC used to select PAEs for the study, we describe the organizational characteristics of the two business models in Section B and

---

[44] All of the results in this passage first appeared in FTC (2016c). In the interest of brevity, descriptions of the underlying data and methodology are abbreviated here, but are spelled out in detail in the full study report.
[45] Information on the workshop, including transcripts and public comments, is available at https://www.ftc.gov/news-events/events-calendar/2012/12/patent-assertion-entity-activities-workshop.
[46] See, for example, Bessen and Meurer (2008) which examines the volume of PAE litigation activity and Feldman and Lemley (2015) which examines the efficiency of the PAE business model.
[47] Materials relating to the OMB approval process for the study along with the Special Orders served on study subjects are available at https://www.ftc.gov/policy/studies/patent-assertion-entities-pae-study.
[48] We direct the reader to the PAE Report (FTC 2016c) for details on these findings and their implications for understanding PAE assertion activity and the possible effects of policy changes.

the empirical differences between them in asserting their patents through demands, litigation, and licenses in section C. In section D, we show that these differences do not carry over into the types of patents held by Portfolio and Litigation PAEs. Section E reviews the wireless chipset case study in which we looked at a patent assertion in a narrow technology area to compare the assertion behavior of PAEs to other patent holders. Section F concludes with a brief discussion of recent legal decisions that could significantly affect PAE behavior in the future.

A. Study Design and Sampling Methodology

As there is no publically available dataset of the entire population of PAEs, the FTC relied on the data collected by third-party vendors to identify the set of possible study candidates. The FTC designed a sampling algorithm that relied on the number of patents held by a PAE and the number of defendants sued by a PAE to select approximately 25 PAEs of varying sizes. Because surveying the population of PAEs was infeasible, the subject selection process was designed to include a range of PAE sizes and to capture variation in assertion behavior based on entity size differences.

The sampling method used by the FTC first generated two score statistics for each PAE in the dataset.[49] The first score represented their count of patents held relative to the PAE with the largest patent holdings. The second score likewise represented the number of unique defendants that a PAE sued for infringement relative to the PAE that sued the most defendants. For each candidate PAE, these two scores were added to generate a combined scalar score variable that gave equal weight to each of the two scores. The algorithm then grouped PAEs into "large", "medium", and "small" strata according to the combined score. A set number of study selection slots were allocated to each of the three strata. These slots were then filled by sampling within each strata. This process resulted in 22 PAEs whose responses to the Special Order (which is, in essence, like a subpoena) formed the basis of the report. We estimated that the respondents in the study covered approximately 75% of PAE patents held and between 14% and 46% of PAE lawsuits terminated during the study period.[50]

[49] For additional detail on the sampling algorithm, see Appendix F of the study report.
[50] Following Office of Management and Budget guidance to capture the bulk of the economically interesting activity, the algorithm was designed to implement a cut-off sampling strategy and selected all of the "large" firms. The method used was not a pure cut-off sampling approach, however, as it also included firms below the "large" threshold.

The Special Order required completion of an extensive survey that had both qualitative and quantitative components. The responses by PAEs to the Order provided details on various aspects of their business such as the patents that they held, infringement lawsuits filed, and licenses and royalties received for their patents over the period January 2009 to September 2014. Staff used documents provided by the PAEs to verify the accuracy of the reported data.

B. PAE Business Models

The FTC defines a PAE as a firm that primarily acquires patents and seeks to generate revenue by asserting them against accused infringers. The FTC observed two distinct PAE business models for generating revenue through patent assertion. The Portfolio PAE business model involved negotiating high-value licenses covering hundreds or thousands of patents, usually without first suing the licensee. Portfolio PAEs typically funded their initial patent acquisitions through capital raised from investors, including investments from manufacturing firms. The Litigation PAE business model involved suing potential licensees and then settling with the defendants shortly thereafter by entering into low-value licenses usually covering fewer than 10 patents. Litigation PAEs typically created a new legal entity, usually a limited liability corporation, for each patent portfolio acquisition, and they generally financed their acquisitions through agreements to share future revenues with the patent sellers. Among the 22 PAE respondents (Responding PAEs), four followed the Portfolio PAE model and 18 followed the Litigation PAE model. These Responding PAEs also provided responses to the Special Order for all of their related entities – typically subsidiaries – that also engaged in patent assertion. The study refers to the combined group of Responding PAEs and related entities as Study PAEs.[51]

C. Study PAE Assertion Behavior

1. Demand Behavior

Prior to the study, there was concern that PAEs were engaged in massive demand letter campaigns to obtain low-value licenses.[52] While all of the Portfolio PAEs used demands, nine of the 18 Litigation PAEs did not send any demands. That is, for nine Litigation PAEs, their first contact with every potential licensee was through a litigation complaint. Study PAEs sent

[51] Responding PAEs provided responses for 327 related entities. Therefore, while there were only 22 PAE respondents, the study analyzed the assertion behavior of 349 entities.

[52] See, for example, *Update: Patent Demand Letter Practices and Solutions: Hearing Before the Subcomm. On Commerce, Mfg., & Trade of the H. Comm. on Energy & Commerce*, 114th Cong. 3 (2015).

demands to relatively few recipients with approximately 30% of the Study PAEs who sent demands sending demands to no more than five recipients. The FTC did not observe Study PAEs engaged in large-scale demand letter campaigns for low-value licenses such as the deceptive large-scale demand letter campaign alleged in the agency's enforcement action against MPHJ in 2014.[53] The impact of Study PAE demand activity on firms receiving the demands was highly skewed: most recipient firms (more than 80%) received only one demand from any Study PAE during the study period, and only a small number of firms received multiple demands from Study PAEs. Less than 1% of demand recipients received more than 10 demands.

2. Litigation Behavior

The unit of analysis in the study of litigation behavior is a "case" which the FTC defined as a dispute between a plaintiff and defendant on a set of patents. Among cases that terminated in the study period, 77% settled, and all settlements in the study granted a license to the defendant. Similar to patterns in patent litigation more generally, the Eastern District of Texas and the District of Delaware accounted for the largest proportion of cases in the study – 53% and 22%, respectively.

Reflecting the differences in their organization, personnel, and business strategy, Portfolio and Litigation PAEs engaged in very different litigation behavior. Litigation PAEs brought 96% of the cases in the study. Litigation PAEs typically asserted no more than two patents in a case. Litigation PAEs settled 76% of their cases and settled quickly; two-thirds of Litigation PAE settlements occurred within 18 months. In contrast, Portfolio PAEs generally asserted five to 10 patents in a case, and all terminated Portfolio PAE cases settled. Portfolio PAE settlements took much longer with half of Portfolio PAE settlements taking more than two years from the time of the initial court filing.

3. Licensing Behavior

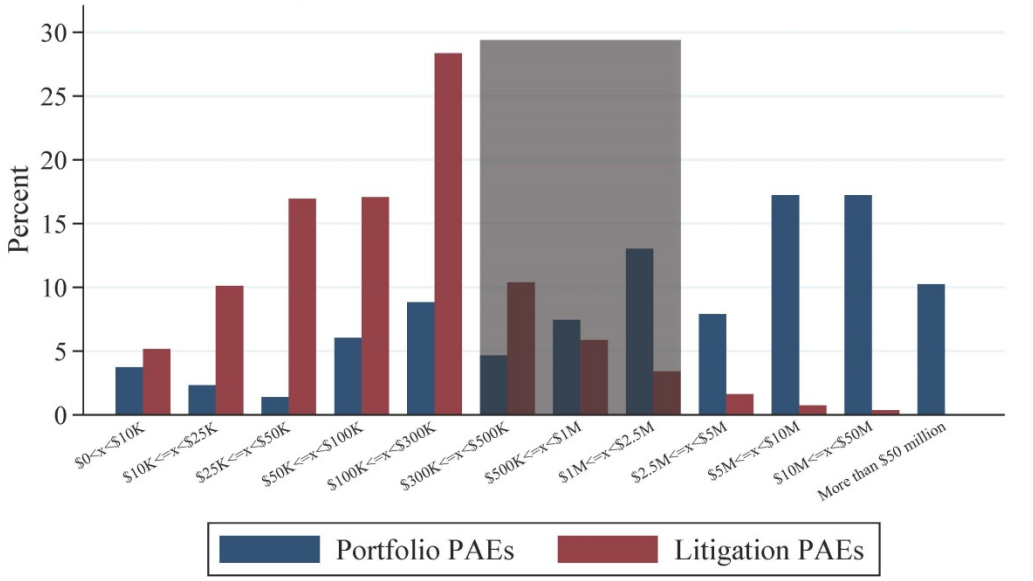
In the FTC's analysis, a "license" corresponds to a distinct licensor/licensee pair licensing a specific set of patents. In total, the FTC analyzed data on 2,715 distinct licenses and 1,463 licensees. Similar to litigation behavior, Portfolio and Litigation PAEs differed on most dimensions of their patent licenses. More than 90% of Litigation PAE licenses resulted from

[53] See the complaint *In the Matter of MPHJ Technology Investments, LLC* available at https://www.ftc.gov/system/files/documents/cases/150317mphjtechcmpt.pdf.

litigation while only 30% of Portfolio PAE licenses were the result of an infringement suit. Second, Portfolio PAEs licenses tended to cover a significantly larger number of patents in each license agreement. Approximately 75% of Portfolio PAE licenses covered more than 1,000 patents. In comparison, more than 90% of Litigation PAE licenses covered fewer than 10 patents.

Figure 3.9 presents the distribution of license royalties for licenses of both PAE types.[54] More than 75% of Litigation PAE licenses generated revenues of less than $300,000, and more than 90% of Litigation PAE licenses returned royalties of less than $1 million.[55] In contrast, 65% of Portfolio PAE licenses generated revenues of more than $1 million, and approximately 10% of Portfolio PAE licenses generated royalties of more than $50 million. Study PAE licenses generated $4 billion in revenue during the study period with $3.2 billion of that total attributable to Portfolio PAE licenses despite Portfolio PAE licenses accounting for only 9% of the licenses in the study.

Figure 3.9: Frequency Distribution of Patent Licensing Royalties



Note: Sample restricted to the 2,364 licenses reporting positive royalty payments, and shaded region corresponds to the licenses that fall within the cost range of defending a NPE litigation through the end of discovery according to the AIPLA.

[54] All figure numbers reference figures in the study report.

[55] In 2013, the American Intellectual Property Law Association reported the cost of defending an NPE patent litigation through the end of discovery is between $300,000 and $2,500,000. Based on this metric, a large share of Litigation PAE assertion activity is consistent with nuisance litigation.

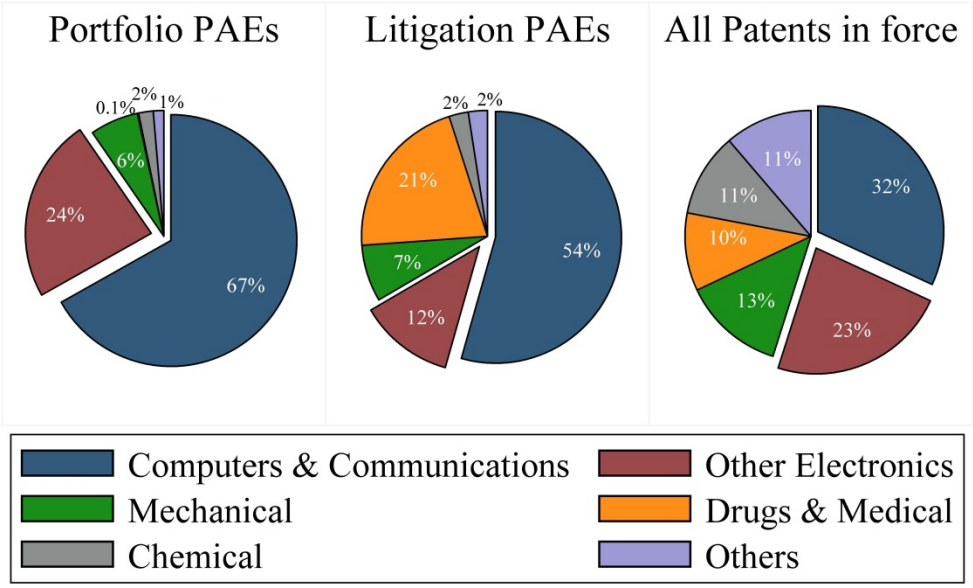
The FTC also examined the structure of the license payments terms. Nearly all Litigation PAE licenses had only a lump-sum component whereas approximately 16% of Portfolio PAEs licenses included a running royalty component that depends on the licensee's future revenues. The difference in license terms between Portfolio and Litigation PAE licenses are consistent with the organizational differences between the two business models. Portfolio PAE agreements tended to require monitoring of future market developments to obtain additional value from the license. Litigation PAEs, however, generally entered into licenses with few terms that required on-going monitoring.

D. Patent Holdings

Consistent with the business models described in Section B, each of the four Portfolio PAEs held more than 1,000 patents and all but one of the 18 Litigation PAEs held fewer than 500 patents, with most holding fewer than 100 patents. Despite differences in portfolio size, Figure 5.2 shows that the distribution of patent technology categories of both Portfolio and Litigation PAE patents were similar, especially compared to the distribution of all patents in force as of the end of 2013. Study patents were more likely to be in the Computers & Communications patent classes than all patents in force. Similar to previous studies of PAE litigation activity, we found that Study PAEs frequently assert software patents: approximately 60% of Litigation PAE patents and 80% of Portfolio PAE patents likely contained software related claims.[56]

[56] See, for example, GAO (2013) and Allison et al (2011). The FTC used the definition of software patents developed by Graham and Vishnubhakat (2013).

Figure 5.2: Study Sample Patent Technologies

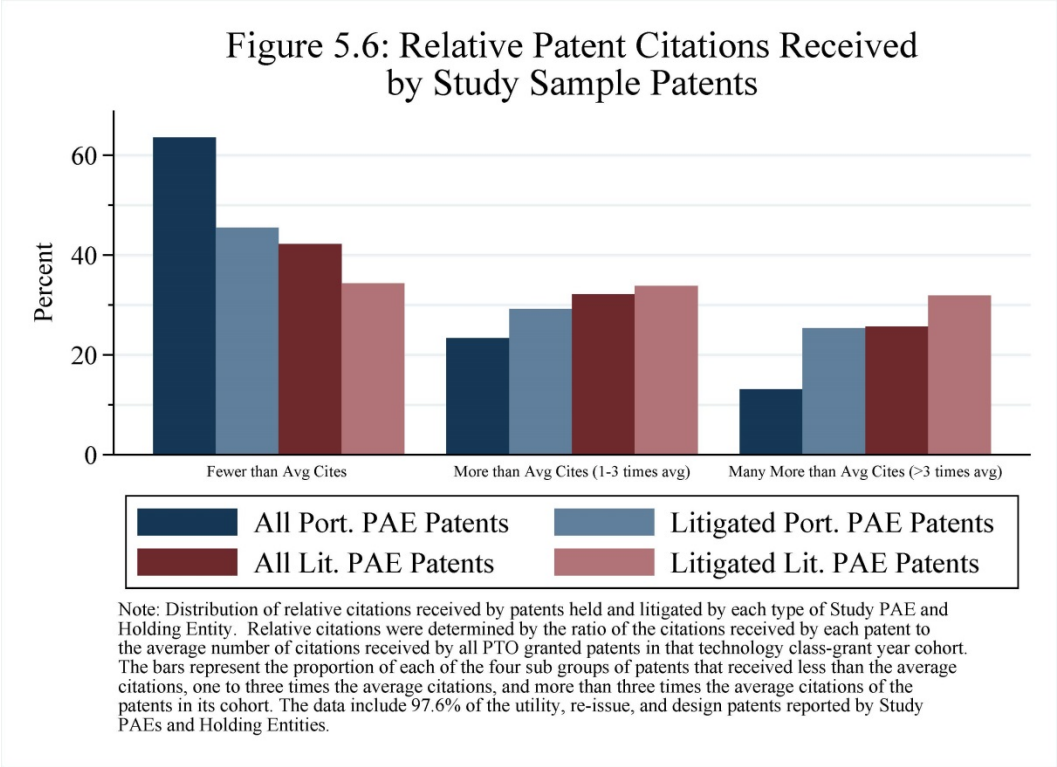


Note: Technology category of all patents held by each type of Responding PAE. 'All Patents in force' represents the PTO estimate of the technology category of all valid patents as of December 31, 2013 (Marco et al. 2015). Figures include 99.9% of utility and re-issue patents reported by Study PAEs and Holding Entities, but exclude applications and design patents.

Some studies of PAEs have argued that PAEs assert patents with low quality.[57] As a proxy for patent quality, FTC looked at forward citation rates. Figure 5.6 shows the distribution of citations relative to a patent's NBER (Hall et. al 2001) technology classification-year cohort for both the set of all study patents and the subset of litigated study patents. Overall, the mean number of relative citations for Litigation PAE patents was 2.5 (median of 1.4) and the mean for Portfolio PAE patents was 1.5 (median of 0.6). With respect to litigated patents, Litigation PAEs patents had a mean relative citations count of 3.1 (median of 1.9) while Portfolio PAE patents had a mean relative citations count of 2.5 (median of 1.3). This evidence is consistent with Study PAEs litigating their higher quality patents and that these patents tend to be of higher quality than the average patent.[58]

[57] See, for example, Allison et al (2011).

[58] This is also consistent with PAEs selecting patents for litigation based solely on citation counts. If the proxy measure has benefits in litigation independent of its relationship to quality, then it may no longer be a useful proxy for quality.



E. Wireless Case Study

To understand the extent to which PAE assertion behavior differs from other patent holders, the FTC compared the assertion of patents relating to wireless chipsets (wireless patents) by PAEs, non-practicing entities (NPEs), and manufacturers.[59] We chose a narrowly defined technology space in order to limit differences in assertion behavior that might result from differences in technology. Wireless case study respondents included all of the 14 Study PAEs that asserted wireless patents, five NPEs, and eight Wireless Manufacturers. We found that Portfolio PAE assertion behavior was most similar to Wireless Manufacturer assertion behavior while Litigation PAE assertion behavior was very different from that of Wireless Manufacturers.

Demands did not appear to be an important assertion strategy for Litigation PAEs or Portfolio PAEs asserting wireless patents relative to NPEs and Wireless Manufacturers. Moreover, two of the Wireless Respondents (a NPE and a Wireless Manufacturer) accounted for almost half of the demands sent, making it difficult to infer differences between firm types.

[59] The FTC defines NPEs as patent holders that primarily seek to develop and transfer technology but do not generally practice their patents through the productions of goods or services.

Litigation involving wireless patents, however, was critical to most of the wireless respondents: nearly 90% of Litigation PAE licenses involving wireless patents followed litigation. Approximately 45% of NPE licenses and 30% of Portfolio PAE licenses involving wireless patent resulted from litigation. However, only 1% of Wireless Manufacturer licenses followed litigation. As in the overall Study PAE sample, Litigation PAE litigations settled quickly: 75% of their cases involving wireless patents settled within 12 months. Only 9% of Portfolio PAE cases involving wireless patents and 13% of Wireless Manufacturer cases settled in that time frame.

The licenses involving wireless patents generated $21 billion in revenue (compared to $4 for all Study PAE licenses) with 80 percent of the revenue attributable to Wireless Manufacturer licenses. The distribution of Study PAE revenues from licenses involving wireless patents was similar to the distribution in the general study. Wireless Manufacturers, however, entered into both a large number of low, or zero, revenue licenses and a large number of licenses generating more than $1 million in revenue. Portfolio PAE royalty terms for licenses involving wireless patents, as the full sample above, were more likely to include running royalty payments, but at a lower frequency than Manufacturers or NPEs. None of the Litigation PAE licenses involving wireless patents had these terms.

F. Conclusion

Many aspects of PAE activities described in the study report are novel contributions to the literature due to our access to data subject to business confidentiality and non-disclosure agreements. The study found that Portfolio PAEs and Litigation PAEs pursued distinct patent assertion strategies that did not depend on the technologies of their patents. This distinction has obvious implications for policy proposals regarding PAEs: changes to patent litigation rules would have significant direct implications for Litigation PAEs but may not affect Portfolio PAEs to the same extent. Moreover, the bulk of the direct economic effect of PAEs (through royalty payments) was related to Portfolio PAEs. However, if more of the total costs of PAE activity are related to litigation, then Litigation PAEs play a more important role than Portfolio PAEs in this regard. Such an analysis was outside of the scope of this study, but the differences in business models have clear implications for potential policy interventions.

Two recent Supreme Court decisions occurring after the study period may significantly affect future PAE activity of both types. *Alice Corp.* may greatly reduce the economic value of software patents that made up the bulk of study patents while *TC Heartland* may greatly reduce

the ability of patent plaintiffs to choose plaintiff-friendly venues like the Eastern District of Texas.[60] Thus, the Portfolio PAE and Litigation PAE business models observed in the FTC study may have limited implications for PAE activity in the near future.

V. Conclusion

The issues addressed by FTC economists as described in the preceding sections demonstrate a number of features of the work done by economists in the FTC's Bureau of Economics. First, the economic analysis can have immediate impact on enforcement and policy decisions that can impact substantial flows of commerce, as well as the welfare of many consumers. Second, the economic questions we confront can range from the relatively abstract, such as the borders that define markets, to the very concrete, such as a quantification of the actions taken by different types of business entities. Finally, we must be able to adapt the methodologies employed in order to suit varying time constraints, information availability, and target audience. All of these features point to benefits from continued engagement with the larger economics community in order to foster further interest in developing new and improved modes of analysis.

VI. References

Allison, J., M. Lemley, and J. Walker. (2011). Patent Quality and Settlement among Repeat Patent Litigants. *Georgetown Law Review*, 99: 677-712.

American Intellectual Property Law Association. (2013). *Report of the Economic Survey*.

Ayres, I. (1985). Rationalizing Antitrust Cluster Markets. *Yale Law Journal*, 95(1), 109-125.

Baker, J. B. (1988). The antitrust analysis of hospital mergers and the transformation of the hospital industry. *Law and Contemporary Problems*, 51(2), 93-164.

Baker, J. B. (2007). Market definition: An Analytical Overview. *Antitrust Law Journal*, 74(1), 129-173.

Baker, J., & Bresnhan, T. (2008). Economic Evidence in Antitrust: Defining Markets and Measuring Market Power. In P. Buccirossi (Ed.), *Handbook of Antitrust Economics* (pp. 1-42). Cambridge: MIT Press.

[60] See, *Alice Corp v. CLS Bank Int'l*, 134 S. Ct. 2347 (2014) and *TC Heartland LLC v. Kraft Foods Group Brands LLC*, 137 S. Ct. 1514 (2017).

Bessen, J. and M. Meurer. (2008). *Patent Failure: How Judges, Lawyer, and Bureaucrats Put Innovators at Risk.* Princeton: Princeton University Press.

Capps, C. S. (2014). From Rockford to Joplin and Back Again: The Impact of Economics on Hospital Merger Enforcement. *Antitrust Bulletin*, 59(3), 443-478.

Capps, C. S., Dranove, D., & Satterthwaite, M. (2003). Competition and Market Power in Option Demand Markets. *RAND Journal of Economics*, 34(4), 737-763.

Capps, C. S., Dranove, D., Greenstein, S., & Satterthwaite, M. (2001). The Silent Majority Fallacy of the Elzinga-Hogarty Criteria: A Critique and New Approach to Analyzing Hospital Mergers. National Bureau of Economic Research.

Davis, P., & Garces, E. (2010). *Quantiative Techniques for Competition and Antitrust Analysis*. Princeton: Princeton University Press.

Dranove, D. (2012). Health Care Markets, Regulators, and Certifiers. In M. V. Pauly, T. G. Mcguire, & P. P. Barros (Eds.), *Handbook of Health Economics* (Vol. 2, pp. 639-690). Elsevier.

Dranove, D., Shanley, M., & White, W. D. (1993). Price and Concentration in Hospital Markets: The Switch from Patient-Driven to Payer-Driven Competition. *Journal of Law and Economics*, 36(1), 179-204.

Elzinga, K., & Hogarty, T. (1973). The Problem of Geographic Market Delineation in Antimerger Suits. *Antitrust Bulletin*, 18(1), 45-81.

Elzinga, K., & Hogarty, T. (1978). The Problem of Geographic Market Delineation Revisited: The Case of Coal. *Antitrust Bulletin*, 23(1), 1-18.

Elzinga, K., & Swisher, A. (2011). Limits of the Elzinga–Hogarty Test in Hospital Mergers: The Evanston Case. *International Journal of the Economics of Business*, 18(1), 133-146.

Environmental Protection Agency. (2015a). "EPA, California Notify Volkswagen of Clean Air Act Violations / Carmaker allegedly used software that circumvents emissions testing for certain air pollutants." Retrieved May 16, 2017, from EPA Web site: https://www.epa.gov/newsreleases/epa-california-notify-volkswagen-clean-air-act-violations-carmaker-allegedly-used.

Environmental Protection Agency. (2015b). "EPA, California Notify Volkswagen of Additional Clean Air Act Violations." Retrieved May 16, 2017, from EPA Web site: https://www.epa.gov/newsreleases/epa-california-notify-volkswagen-additional-clean-air-act-violations.

Farrell, J., Pautler, P. A., & Vita, M. G. (2009). Economics at the FTC: Retrospective Merger Analysis. *Review of Industrial Organization*, 35, 369-385.

Federal Trade Commission. (2016a). “FTC Charges Volkswagen Deceived Consumers with Its “Clean Diesel” Campaign.” Retrieved May 16, 2017, from FTC Web site: https://www.ftc.gov/news-events/press-releases/2016/03/ftc-charges-volkswagen-deceived-consumers-its-clean-diesel.

Federal Trade Commission. (2016b). “https://www.ftc.gov/news-events/press-releases/2016/06/volkswagen-spend-147-billion-settle-allegations-cheating.” Retrieved May 16, 2017, from FTC Web site: https://www.ftc.gov/news-events/press-releases/2016/06/volkswagen-spend-147-billion-settle-allegations-cheating.

Federal Trade Commission. (2016c). Patent Assertion Entity Activity: An FTC Study (2016).

Federal Trade Commission. (2017). “Federal Trade Commission, Class Action Settlements Require Volkswagen to Repair or Buy Back 3.0 Liter TDI Diesel Vehicles.” Retrieved May 16, 2017, from FTC Web site: https://www.ftc.gov/news-events/press-releases/2017/02/federal-trade-commission-class-action-settlements-require.

Feldman, R. and M. Lemley. (2015). Do Patent Licensing Demands Mean Innovation? , 101: 137-189.

Field, K., Fisher, L. K., & Coglianese, W. D. (2017). The Flaws in Using the Hypothetical Monopolist Test from the 'Payor Perspective' in Health Care Merger Cases. *Antitrust Source*, 17(1), 1-11.

Garmon, C. (2015). The Accuracy of Hospital Merger Screening Methods. FTC Bureau of Economics Working Papers.

Gaynor, M. S., Kleiner, S. A., & Vogt, W. B. (2013). A Structural Approach to Market Definition with an Application to the Hospital Industry. *Journal of Industrial Economics*, 61(2), 243-289.

Gaynor, M., & Pflum, K. (2017). Getting Market Definition Right: Hospital Cases and Beyond. *Competition Policy International Antitrust Chronicle*.

Gaynor, M., Ho, K., & Town, R. (2015). The Industrial Organization of Health Care Markets. *Journal of Economic Literature*, 53(2), 235-284.

General Accountability Office. (2013). *Assessing Factors that Affect Patent Infringement Litigation Could Help Improve Patent Quality*.

Ghili, S. (2017). Network Formation and Bargaining in Vertical Markets: The Case of Narrow Networks in Health Insurance. Yale University working paper.

Graham, S. and S. Vishnubhakat. (2013). Of Smartphone Wars and Software Patents. *Journal of Economic Perspectives*, 27: 67-86.

Hall, B., A. Jaffe, and M. Trajtenberg. (2001). The NBER Patent Citation Data File: Lessons, Insights, and Methodological Tools. NBER Working Paper No. 8498.

Kaplow, L. (2010). Why (Ever) Define Markets? *Harvard Law Review*, 124(2), 437-517.

Kaplow, L. (2014). Market Definition: Impossible and Counterproductive. *Antitrust Law Journal*, 79(1), 361-380.

Katz, M., & Shapiro, C. (2003). Critical Loss: Let's Tell the Whole Story. *Antitrust*, 17, 49-56.

Levitas, P., & Marra, B. M. (2016). 'FTC V. Penn State Hershey Medical Center': Third Circuit Appeal Could Lead to Important Decision for Future Hospital Mergers. *Competition Policy International Antitrust Chronicle*, 1(2), 1-7.

Liebman, E. (2017). Bargaining in Markets with Exclusion: An Analysis of Health Insurance Networks. University of Georgia working paper.

Love, B. (2013). "An Empirical Study of Patent Litigation Timing: Could a Patent Term Reduction Decimate Trolls without Harming Inventors?" *University of Pennsylvania Law Review*, 161: 1309-1359.

O'Brien, D. P., & Wicklegren, A. L. (2003). A Critical Analysis of Critical Loss Analysis. *Antitrust Law Journal*, 71(1), 161-184.

Raval, D., Rosenbaum, T., & Wilson, N. E. (2015). Industrial Reorganization: Learning about Substitution Patterns from Natural Experiments. FTC Working Paper Series.

Raval, D., Rosenbaum, T., & Wilson, N. E. (2017). Predictions Without Models? Using Natural Experiments to Test the Performance of Machine Learning Algorithms . FTC working paper.

Tenn, S. (2017). Key Takeaways from the Advocate-NorthShore Merger Litigation. *Competition Policy International Antitrust Chronicle*.

Thompson, G. J., Carder, D. K., Besch, M. C., Thiruvengadam, A. & Kappanna, H. K. (2014). "In-use emissions testing of light-duty diesel vehicles in the United States." Center for Alternative Fuels, Engines & Emissions, West Virginia University.

Town, R., & Vistnes, G. (2001). Hospital competition in HMO networks. *Journal of Health Economics*, 20(5), 733-753.

U.S. Department of Justice and the Federal Trade Commission. (2010). Horizontal Merger Guidelines.

Werden, G. J. (2014). The Relevant Market: Possible and Productive. *Antitrust Law Journal*, online archive.