PRELIMINARY DRAFT—PLEASE DO NOT CITE

How to get away with merger: Stealth consolidation and its effects on US healthcare*

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Abstract

Most US mergers are not reported to the federal government on the basis of their size. This can effectively *exempt* them from antitrust scrutiny, resulting in mergers to monopoly and duopoly, even in industries where enforcement is otherwise robust. This paper studies the impact of premerger notification exemptions in the context of US dialysis providers. First, I find large effects on enforcement. For instance, many proposed dialysis facility acquisitions that would otherwise be blocked over 95% of the time are blocked less than 5% of the time when exempt from premerger notification requirements. Second, I find equally important effects on market structure. Exempt facility acquisitions account for nearly all of the rise in industry-wide within-market concentration over the last two decades. In fact, applying the enforcement rates faced by reportable mergers to exempt mergers stalls the dramatic consolidation of the dialysis industry. Finally, facility acquisitions associated with exempt mergers compromise the quality of care received by patients.

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1 Introduction

Since at least as early as 2006, Angelo Dialysis Centers and Fresenius Medical Care competed for dialysis patients in Del Rio, Texas and its surrounding areas. In 2013, Fresenius acquired its only rival, located one-and-a-quarter miles north on the same road. With subsequent entry unlikely,[1] no other treatment options for over sixty miles,[2] and the Federal Trade Commission blocking hundreds of less egregious facility acquisitions over the past two decades, why was this one permitted? Most likely, the agencies never knew it was proposed. Though it profoundly affected market structure, the merger it was a part of transferred ownership of only three facilities, thus exempting it from premerger notification requirements. Were it part of a larger merger, it would have been reported to the government and almost surely blocked.[3]

The prospect of exempt but anticompetitive mergers is unique to neither the dialysis industry, nor the healthcare sector, nor even the US economy. Governments worldwide require firms to inform them in advance of merging but absolve most deals on the basis of their size, reasoning that small deals do not induce large changes in market power—logic that cannot be uniformly applied to segmented markets, including the one above. There, even minor deals can result in major consolidation, and even mergers to monopoly may not trigger premerger notifications. Such events—which I call *stealth consolidation*—are not merely possible in theory but, as this paper shows, also quite common in practice, even in economically important industries where antitrust enforcement has otherwise been robust.

This paper studies these issues in the context of US dialysis providers. Recent work (Wollmann [2019]) suggests that premerger notifications are a first order concern for enforcement: exempting deals from reporting requirements may be tantamount to exempting them from antitrust scrutiny altogether. However, prior findings relied on economy-wide data, which limited the empirical exercise to coarse measures of rivalry, precluded it from directly assessing the effects on market structure and real economic outcomes, and possibly missed many unpublicized deals. Since the present paper relies on industry-specific establishment-level administrative data, it can directly link acquisitions and enforcement actions to market-level measures of competition, comprehensively measure their impact on concentration, and evaluate their real effects.

The dialysis industry provides an excellent setting to study stealth consolidation. First, it is clearly

[1] Boilerplate language in FTC complaints directed towards dialysis mergers state "significant barriers to entry" exist in established markets, and indeed no entry has occurred since this merger. See, e.g., *The Federal Trade Commission in the Matter of DaVita et al* available at https://www.ftc.gov/system/files/documents/cases/1510204_DaVita_complaint.pdf.

[2] At present, the nearest rival is Maverick County Dialysis, located 66 miles away in Eagle Pass, Texas.

[3] More than 95% of proposed mergers to monopoly require divestitures. See Section 4.

geographically segmented, since patients receive several treatments per week and thus are limited in how far they can travel to a provider.[4] Second, it has witnessed terrific within-market and industry-wide consolidation [Cutler et al., 2016].[5], which predominantly reflects merger activity. In the mid-1990s, the industry consisted of mostly small chains alongside thousands of independently-run facilities, but today nearly three-quarters of all clinics are owned by two large firms. Third, transactions in this industry range from single facility acquisitions to mergers between chains comprising hundreds of locations. Conveniently, about half of proposed facility acquisitions are part of mergers large enough to require notification under US law, with the remainder exempt. Last, the US agencies have aggressively challenged dialysis deals (at least when they receive notice of them), forcing the divestiture of hundreds of proposed facility acquisitions and suggesting market power represents a serious concern.

These features aside, one should also note that dialysis is socially and economically important enough to study on its own. Treatments represent life-saving care for persons suffering kidney function loss, called End Stage Renal Disease, or "ESRD." Without kidneys to filter toxins from their blood, patients rely on machines to do so for them. ESRD affects over 700,000 Americans, with 120,000 new cases diagnosed each year. Treatments are frequent and long. Patients are dialyzed on average three times per week, four hours each time. Even so, mortality rates are very high—as many as 200 deaths per 1,000 patient years. Moreover, treatment for the disease costs over $100 billion annually, with most of the burden for payment falling on Medicare.[6]

My data consist of detailed facility-year observations. For each, I observe the name, location and parent company well as the number of hemodialysis stations, nurses, and patients. *(Subsequent drafts of the paper will also include patient outcomes; the data is forthcoming from its provider.)* Frequently, parent companies attempt to acquire some or all of the facilities from another parent company. For each proposed facility acquisition, I observe which are part of mergers that require premerger notification and which are not. When the US agencies judge a proposed facility acquisition anticompetitive, they require it be divested as a precondition to completing the merger of which it is a part. I observe which proposed facility acquisitions required divestiture and which did not, and I observe to whom each was sold.

The paper consists of three main exercises. First, it estimates the effect of exemptions on enforcement. That is, it asks whether providers acquire rivals' facilities in deals that would otherwise be blocked but

[4]Remarks made by the FTC about the size of the "relevant market" state that "as a general rule, ESRD patients travel no more than thirty miles or thirty minutes to receive dialysis treatment." See the complaint referenced in Footnote 1.

[5]See also Eliason et al. [2018] and Eliason [2018], described below, which provide equally careful summaries.

[6]USRDS. "Annual Data Report." 2017. https://www.usrds.org/2017/view/Default.aspx

for exemptions to reporting requirements. I rely on variation in merger size relative to an exemption threshold set by law, which exempts a well-define set of mergers. I also rely on variation in premerger market structure, which allows me to calculate market-level "proforma" HHI changes for each merger, i.e. the amount HHI will increase within each market from a particular merger being completed (calculated at premerger market shares). I employ a difference-in-difference research design, which tests whether the relationship between antitrust enforcement actions and proforma HHI increases is larger for reportable than exempt proposed facility acquisitions.

Second, the paper quantifies the extent to which stealth consolidation contributes to the dramatic rise in industry concentration. To do so, I estimate enforcement rates on reportable proposed facility acquisitions alone, apply the estimates to exempt proposed facility acquisitions, re-compute market-by-market HHI, and compare the resulting "counterfactual" market structure to its empirical counterpart, i.e. what I observe in the data.

Third, the paper estimates the effect of ownership consolidation on "real" outcomes. I rely on the previously described sources of variation as well as on variation in the timing of mergers, which provide pre- to post-merger comparisons. Thus, I employ a triple-difference (DDD) research design. Theory is ambiguous on how price, quantity, quality, and patient outcomes will respond. Concentration may induce scale economies or facilitate learning, though it may also reduce the ability of patients to substitute towards rival producers, resulting in lower quality of care. *(Note that the current draft cannot directly estimate an effect on prices or patient-level health outcomes; that assessment depends on data that is forthcoming.)*

There are three broad conclusions. First, enforcement depends critically on notification. The competition authorities aggressively pursue reportable mergers, preventing hundreds of proposed facility acquisitions, with agency actions tightly tied to market-level concentration measures. Proforma HHI increases alone provide an excellent predictor of whether the competition authorities will require a divestiture of a facility or not. Strikingly, though, enforcement actions are almost entirely absent among exempt proposed facility acquisitions, regardless of their effect on market structure. In short, many mergers that would otherwise be blocked more than 95% of the time are blocked less than 5% of the time due to the exemption.

Second, exempt mergers drive nearly all of the the dramatic market-level industry-wide consolidation. That is, if one applies the divestiture rates faced by reportable deals to exempt deals, concentration rises very little over the sample. In particular, while observed average HHI rose just over 2,500 to nearly 4,000, counterfactual HHI rose less than 100 points. The exercise holds fixed firm behavior, and the

alternative policy consumes potentially costly agency resources, so this result (clearly) cannot advocate for one policy over another. Nonetheless, the results are striking, especially given the recent, growing interest in economy-consolidation, a point I return to below.

Third, I find that consolidation compromises quality of care, consistent with structural estimates found in [Eliason, 2018]. Nurses per technician, patients per employee, and patients per station all decline as market-level concentration rises. The effects are particularly pronounced for large increases in concentration. The latter fact reconciles these estimates with those found in [Cutler et al., 2016] and [Eliason et al., 2018], as described below. It also highlights why notification exemptions may be so costly: they permit precisely the type of facility acquisitions that are likely to be harmful to competition. *(Effects on prices and patient outcomes—HGV levels, urea reduction ratios, and hospital admissions—are forthcoming in subsequent drafts.)*

The paper contributes to several literatures. Alongside Wollmann [2019], it presents stealth consolidation as a potentially important determinant of market structure and contributor to secular trends in economy-wide concentration.[7][8] Motivated partly to explain a fall in the otherwise historically stable labor share of output [Elsby et al., 2013, Karabarbounis and Neiman, 2013], various papers have related rising concentration to that decline [Barkai, 2016, Autor et al., 2017] as well as to falling private investment [Gutiérrez and Philippon, 2016], rising price-cost markups [De Loecker and Eeckhout, 2017], and rising "profit shares" [Barkai, 2016].[9] However, few papers have attempted to explain rising concentration itself. Autor et al. [2017] document that especially productive "superstar" firms have grown their share of output over past decades, which they argue might reflect the benefits of having a low cost structure during a period of increasing price sensitivity. Alternatively, Peltzman [2014] proposes a shift towards more permissive merger policy, especially with the *1982 Merger Guidelines*, which more closely reflect Robert Bork's view that antitrust should target consumer welfare rather than competition per se.

This paper also relates to work on competition among healthcare providers and, in particular, those offering dialysis treatments. Cutler et al. [2016] carefully document the sharp rise in dialysis industry concentration, with the share of all facilities owned by the top two firms climbing from 28% in 1998 to nearly two-thirds in 2009. They study the effect of two large mergers but do not find effects on

[7]Note that premerger notification thresholds have risen sharply worldwide. Wollmann [2019] studies an abrupt, major revision of US thresholds, effective February 2001, which precipitated a 70% decline in premerger notifications.

[8]See [Furman and Orszag, 2015] for a brief, clearly written review.

[9]Azar et al. [2016] point out that even holding fixed standard measures of concentration concentration, effective concentration may have risen over the past several decades due to increasing "common ownership" of rival public firms by large financial intermediaries, who internalize competitive effects across these holdings, leading to "softer" competition. See also Antón et al. [2016].

patient outcomes. These estimates, though, are consistent with my own; their exercise selects on large facility acquisitions that the agencies opted not to challenge, which I also find not to have harmed care. Eliason [2018] estimates a structural model of dialysis provider competition. He finds that "local" market power—in the geographic sense—harms consumers to the degree that even travel subsidies meaningfully improve mortality. Eliason et al. [2018] study acquisitions of small, independent operators by large chains. They present provocative evidence that these ownership changes lead to higher prices but lower quality, even holding fixed market structure.[10] Rapid consolidation has occurred among providers outside dialysis as well. These range from hospitals to physicians groups Gaynor et al. [2015], the latter of which Capps et al. [2017] show consolidate a few doctors at a time—transactions so incremental that even if premerger notifications were required, reported concentration increases would typically not merit further review under the *Horizontal Merger Guidelines*. Recent work raises clear concerns about mergers among healthcare providers (e.g. Gowrisankaran et al. [2015]), though results are still mixed overall [Gaynor et al., 2015].

The paper proceeds as follows. Section 2 provides background on merger activity, antitrust enforcement, and dialysis care in the US. Section 3 provides an empirical framework, and Section 4 reports the estimates. Section 5 concludes.

2 Institutional details

2.1 Kidney disease and treatment

Dialysis facilities treat patients with a loss of kidney function, commonly called "End Stage Renal Disease" or simply "ESRD." These organs, which are located in the abdomen, are compromised by chronic conditions such as diabetes and high blood pressure as well as, in rare cases, acute injury. When their ability to filter toxins from the blood falls as low as 10-15% of normal levels, patients require immediate care. They may either receive a healthy kidney via transplant, for which there are waiting lists, or receive dialysis treatments.

Hemodialysis (HD) is by far the most common form of dialysis in the US, serving over 90% of Americans receiving treatments. Patients are attached to machines that, in effect, serve as external kidneys. Specialized physicians, called nephrologists, supervise treatment regiments. On average, these

[10] In fact, the authors find little to no effect of concentration on quality measures, though their estimates are not in conflict with my own. Market structure changes in their paper are mostly used to effectively rule out that their main effect is not driven by competition related factors. They accomplish this with an indicator for whether the attempted facility acquisition resulted in a positive HHI increase. The estimated coefficient on this measure is close to zero, although I find the same thing; real effects tend to rely on large HHI increases.

comprise three sessions per week, each lasting four hours. During this time, patients can engage in sedentary activities, e.g. reading or watching television.

Per capita rates of ESRD, adjusted for age and comorbidities have remained mostly flat since the mid- to late-1990s. Unadjusted rates, however, have risen by one fourth, reflecting an older and more obese US population. Mortality rates for HD patients fell 30% until 2012, with little consensus around the cause(s), and have not meaningfully fallen since that period. Moreover, adjusted rates are still high and reflect large regional variation. There are about 130 deaths per 1,000 HD patient years nationwide, and rates are more than one-quarter higher in, for example, the pacific northwest relative to the south-central states.[11]

There are 6,500 outpatient facilities housing 115,000 HD stations in the US. These provide most treatments. (Inpatient facilities serve residents of hospitals and other extended-stay locations.) Over three-quarters of these locations are freestanding, i.e. not attached to any hospital or transplant facility, and 90% operate for profit.[12] Although the US dialysis industry initially consisted of a mostly independent network of providers, today two large chains dominate the US dialysis industry.

2.2 Antitrust enforcement and premerger notifications

Since ownership transfers among these providers affect domestic commercial activity, they are subject to US antitrust law. Section 7 of the Clayton Act represents the cornerstone of the relevant legislation, critically stipulating that no such transfer may "substantially lessen competition, or...tend to create a monopoly." History, though, proved Section 7 to be partly ineffective on its own. Prior to 1976, many or even most direct competitors wishing merge avoided scrutiny in practice by transacting quietly and covertly so that when the relevant authorities eventually learned of the transaction, the parties were already inextricably wound together. As Senator Hart remarked while introducing a bill intended to remedy the situation,[13][14]

> Until recently, the only method the [DOJ] and FTC had to be aware of pending mergers and acquisitions was to read the general and trade press. In other words, if the Wall Street Journal missed one, so well may the FTC and the [DOJ]."

[11] USRDS. "Annual Data Report." 2017. https://www.usrds.org/2017/view/Default.aspx
[12] Ibid.
[13] 121 Congressional Record 8143 (1975).
[14] The "Antitrust Division" is the specific group within the Department of Justice that handles merger-related enforcement. Senator Hart references the group name in the quote below, but I replace it with the department name so as to not confuse readers who may not be familiar with the agency's structure.

That year, however, Congress provided bipartisan, bicameral support to the Hart-Scott-Rodino ("HSR") Antitrust Improvements Act, which created a US premerger notification program. Today, nearly all national and supranational governments with antitrust legislation maintain similar programs.

The Act requires parties to all proposed mergers, unless explicitly exempt, to notify the agencies of their intentions and wait up to thirty days.[15] During this time, the DOJ or FTC can review the competitive aspects of the transaction. The Act also empowers the agencies to compel firms to provide additional information should initial filings present concern. (Since investigations are generally limited to committed crimes and no laws are broken until the parties actually merge, responding to these "second requests" would largely be discretionary without this provision.)

Exemptions are based mainly on size. For most service sector firms, criteria are simple and straightforward. The Act, as written, stipulated notification requirements based on a size-of-persons test, which was typically satisfied when the target firm's assets met or exceeded $10 million. Effective 2001, the Act was amended to add a size-of-transactions test, so that in order to require notification, a merger must also have a transaction value at or over $50 million. Though the figures were stated in nominal terms, the Amendment also allowed all thresholds to increase at GNI growth beginning in early-2005. As amended, these provisions today exempt transactions valued below $80 million.

Throughout the sector, these thresholds, especially as amended in 2001, exempt all but the largest deals. In the dialysis industry, individual facilities sell for $2.5-5 million.[16] Thus, for most of the last two decades, almost all ownership transfers involving less than ten to twenty locations were exempt. A better understanding of ownership patterns, though, requires a more detailed description of the data.

3 Data

3.1 Sources

The data span from 1997 to 2017. The Centers for Medicare & Medicaid Services, through their *Provider of Service* and *Healthcare Cost Report Information System* files, provide the name, location, chain owner, opening and closing dates and change-of-ownership dates[17] as well as a unique identifier.

[15] See Baer [1996] for a more comprehensive review, including a discussion of its wide-reaching implications for enforcement.

[16] These estimates come from Irving Levin Associates Health Care Services Acquisitions Report. For example, Midwest Kidney Centers sold at $3.8 million per facility in 2004, 105 freestanding Fresenius locations sold at $4.9 million per facility in 2006, and Dialysis Corporation of American sold at $3.2 million per facility in 2010.

[17] Medicare data on ownership and ownership changes are supplemented using Financial statements, press releases, and the Levin Associates Health Care Services Acquisition Reports. These combine to provide comprehensive facility-level ownership histories, at least judging by how closely the number of facilities owned by various parents at various points in time compare to the figures provided by the FTC in their complaints, which are based on internal up-to-date ownership data and therefore are

They also provide the number of HD stations, nurses, and patients. Patient-level health outcomes including mortality, incidences of infection, and measures of toxin elimination, are forthcoming. *(The data agreement with the US Renal Data System is currently under review.)*

The US competition authorities conveniently summarize and publish the details of each merger enforcement action, including the dates of the initial complaint and the final order, the identity of the target and acquirer, the number of facilities that each operates at the time of the merger, and any divestitures that the Commission and the parties have agreed upon. Critically, this includes the name and location of any facility the agencies order divested as well as the entity to whom it is sold.

3.2 Definitions

Throughout the paper, *facilities* mean individual locations offering HD treatment, while *stations* mean the machines within those facilities that dialyze the patients. (Each station treats no more than one patient at a time, so they provide a peak capacity measure.) A *market* denotes one or more counties. Geographic boundaries follow US agency convention: Core Based Statistical Areas (CBSAs) are used for facilities that fall within one, and counties are used otherwise.

Each facility has exactly one *parent*, or ultimate owner, at any given point in time. *Mergers* transfer ownership over a set of facilities from one parent to another.[18] Thus, each merger has one or more *proposed facility acquisitions* associated with it. The FTC, which has de facto responsibility for healthcare mergers, determines whether each results in a *completed facility acquisition* or a *divestiture*, i.e. sale to an unaffiliated party. Mergers falling within the purview of the Act and thus requiring a premerger notification to the FTC and DOJ are denoted *reportable* mergers, while those that fall outside are denoted *exempt*. HHI measures market-level concentration.[19] $Proforma\ HHI$ measures concentration assuming that a set of proposed facility acquisitions are complete, i.e. it calculates HHI assuming the target facilities are owned by the acquirer.

measured without error.

[18]Technically, if all facilities owned by a parent are acquired by another parent, i.e. if one parent acquires another, then the acquired parent simply ceases to exist.

[19]This is more informative than industry-level concentration, which is more frequently calculated due to data limitations. The distinction is important. Suppose one wants to assess concentration changes over a time series as they might pertain to market power. Suppose that each local geographic market initially contains two independent firms and that, over time, two large chains each acquire one firm in each market. Industry HHI rises from near zero to 5,000—a dramatic rise implying a substantial drop in competition. Market HHI goes unchanged, reflecting reality (leaving aside, of course, the prospect of coordinated effects through multi-market contact, et cetera).

3.3 Summary

Table I chronicles dialysis industry growth from 1997 to 2017. Over this period, facilities more than double from approximately 3,200 to 7,000. Stations, staff, and patients expand at approximately the same rate. By 2017, nearly 60,000 registered nurses are serving almost 470,000 ESRD patients.

[Table I about here.]

The penultimate column tallies the number of markets for which at least one outpatient dialysis facility exists. Comparing this with the prior figures, it is clear that from the point of view of most patients, the bulk of provider growth is at the intensive rather than extensive margin. That is, the expansion in facilities, stations, and other proxies for capacity occurs mainly within markets where some form of care is already available. This is to be expected. Since dialysis is a required treatment for ESRD patients and has few substitutes (besides transplants, which are relatively rare, and emergency room admissions into inpatient treatment, which are very costly), most markets house at least one facility at the beginning of the panel.

Most striking, though, is the rise of large chains and terrific consolidation. Large chain ownership triples by 2017, at which point chains account for 87% of all facilities. It increases even more—about 430% over the panel—when the definition is restricted to parent companies owning at least three hundred instead of thirty facilities (not shown). Alongside this, average market-level HHI increases as well, reaching nearly 4,000 by the end of the panel.

Table II summarizes merger activity and antitrust enforcement within the dialysis industry. Both are remarkably robust. First, despite an average of only 5,000 facilities operating in any given year, ownership stakes in over 4,000 change hands over the panel. Second, the majority of facility acquisitions are *exempt* from the US premerger notification program. This follows from the fact that most mergers are not between large chains but rather from the purchase of individual locations or small, regional groups of facilities. Third, divestitures ordered by the FTC, which has de facto responsibility for healthcare deals, are very frequent. More than 250 are ordered over the panel—more than 10% of all proposed facility acquisitions involving a reportable merger.

[Table II about here.]

These tables present a growing industry that is nonetheless rapidly consolidating, despite frequent challenges from the competition authorities. However, basic questions remain unanswered as to whether concentration increases reflect "within-market" consolidation, which deals are being pursued

by the US agencies, and how this relates to premerger notifications. These issues are explored in the following section.

4 Empirical framework

4.1 Effects on enforcement

The HSR Act does not provide safe harbor. The agencies can challenge deals of any size as well as revisit transactions from the past, even if they previously received premerger notification and opted not to act. Which mergers are challenged in practice, however, is an empirical question. Agency officials and antitrust attorneys (at least publicly) obfuscate or even disagree on this point. Consistent with enforcement that is confined mostly to premerger notifications, former FTC Commissioner Maureen Ohlhausen states,[20]

> We don't have control over the mergers that are brought to us. They walk in the door. We're generally challenging HSR-reportable mergers. Sometimes we do pursue consummated deals, including ones that are under the HSR threshold. But for the most part, mergers are what come through the door for us.

However, consistent with broader agency awareness, former DOJ Deputy Assistant Attorney General Leslie Overton states, "The HSR reporting thresholds...are not synonymous with the contours of antitrust enforcement."[21] Similarly, the antitrust chair of one well-known multinational law firm states, "Merging parties should not assume that because a deal is too small to be reportable that antitrust constraints do not apply."[22]

Wollmann [2019] suggests that the former rather than latter view holds, though with much coarser measures of rivalry than exist with this research design. That paper exploits an abrupt change in the size-of-transactions threshold and finds that relative to "never exempt" mergers, enforcement actions directed towards "newly exempt" mergers fall almost to zero after the threshold increase. It shows that this is not because "rival" firms merely cease proposing mergers below the amended threshold,[23]

[20] "The Capitol Forum: Interview with FTC Commissioner Maureen Ohlhausen." September 30, 2014, Washington, DC. https://thecapitolforum.com/wp-content/uploads/2015/04/Capitol-Forum-Interview-with-FTC-Commissioner-Ohlhausen-2.pdf (retrieved December 1, 2017).

[21] "Remarks as Prepared the 14th Annual Loyola Antitrust Colloquium, Institute for Consumer Antitrust Studies." April 25, 2014. Chicago, Illinois.

[22] M&A Advisor. "Halcyon days are here again: The return of antitrust to M&A (Special report)," 2014. http://maadvisor.net/MAA-market-intel/best-practices/third-edition/special-report-halcyon-days-are-here-again.pdf (retrieved November 12, 2017).

[23] In fact, these rise, presumably reflecting a deterrence effect.

though its use of economy-wide data limits the notion of rivalry to whether a target and acquirer operate in the same four-digit SIC-defined industry. For example, it would (incorrectly) characterize the merger of California and Massachusetts dialysis facilities as "horizontal," whereas the present work (correctly) does not. Thus, it remains an empirical question what result obtains when a precise measure of rivalry, such as the one considered below, is used.

I employ a difference-in-differences (DD) research design to measure the effect of reporting requirements on antitrust enforcement. This approach relies on variation in merger size relative to the size-of-transaction test threshold stipulated by the Act. The test exempts a well-defined group of mergers comprising more than half of all proposed facility acquisitions. For example, suppose that facilities sell for approximately $4 million, and suppose that in 2003 parent A purchases parent B, which owns 10 facilities, for $40 million and parent C, which owns 15 facilities, for $60 million. Since the exemption threshold sat at $50 million that year, the agencies are notified about none of the proposed facility acquisitions associated with the A-B merger but all of them associated with the A-C merger.

The approach also relies on variation in premerger market structure. This allows me to separate proposed facility acquisitions into those that are likely to significantly reduce competition and those that are not. For instance, suppose that in market A two among ten equally sized rivals merge, while in market B two among three equally sized rivals merge. In A, proforma HHI increases only 200 points. In B, it increases 3,267 points. Note that these measures are easy to compute: they equal exactly two times the market share of the acquirer times the share of the target (where shares are equal to the proportion of patients served in the market prior to the merger by the provider multiplied by 100).

I am interested in whether the relationship between antitrust enforcement actions and proforma HHI increases is larger for reportable proposed facility acquisitions than exempt ones. I assume that the relationship among reportable and exempt transactions would otherwise be the same were it not for differential exposure to antitrust scrutiny vis-a-vis differences in reporting requirements.

Prior to estimation, I collapse the data down to merger-market observations from merger-market-facility observations. In many cases, the target firm operates multiple facilities in a single market. For obvious reasons, when the FTC does intervene, it typically requires the parties divest all target facilities, not just a portion of them. Failing to collapse the data to the merger-market level would result in double counting cases where the target operated two facilities prior to the merger, triple counting those where it operated three, and so forth.

The DD estimating equation is given by

$$I_i^{Divestiture} = \alpha_0 + \alpha_1 \; I_i^{HSR} + \alpha_2 \; I_i^{\Delta HHI>1,000} + \alpha_3 \; I_i^{HSR} \cdot I_i^{\Delta HHI>1,000} + \epsilon_i. \tag{1}$$

The unit of observation is a merger-market. That is, if parent A attempts to acquire three facilities from parent B, two of which are in market X and one of which is in market Y, then this merger generates two observations—one for X and one for Y. $I_i^{Divestiture}$ denotes an indicator for divestiture, taking a value of one if the FTC requires the parties to sell off at least one facility in the market to a third party as a precondition of consent to the merger and zero otherwise. I_i^{HSR} denotes an indicator that takes a value of one if the merger was reportable and zero otherwise. $I^{\Delta HHI>1,000}$ denotes an indicator based on premerger market structure. It takes a value of one if proforma market share increases more than 1,000 points and zero otherwise. α_3 is the coefficient of interest.

4.2 Effects on market structure

To predict how market structure would have evolved in the absence of notification exemptions, I apply divestiture rates estimated on reportable mergers to exempt mergers. Specifically, I begin the algorithm in the second year of the data, 1998. Each exempt transaction results in either a divestiture or not. I estimate the probability of divestiture using Equation 1, limiting the sample to i such that $I_i^{HSR} = 0$, and then predicting divestiture rates for exempt deals using the resulting coefficients.[24] This yields the probability that (exempt) merger-market i will require a divestiture. I denote this probability ρ_i and then compute $HHI_i^{\star} = \rho_i HHI_i + (1 - \rho_i) HHI_i'$. I then iterate this process forward in time. I then compute average industry-wide market structure, weighting by the number of patients in each market.

To illustrate, suppose that a particular market has four facilities throughout the sample and that in 1997 they were separately owned. Denote the facilities A, B, C, and D. Further, suppose that A acquired B in 2005, forming A-B, as part of an exempt merger and that the predicted probability of divestiture is 0.7. Finally, suppose that A-B acquired C, forming A-B-C, as part of an exempt merger, that if A-B was completed, the predicted probability of divestiture is 0.6, and that if A-B was not completed, the predicted probability of divestiture is 0.5.

In this example, $HHI_i^{\star} = HHI_i$ from 1997 through 2004. From 2005 through 2009, $HHI_i^{\star}$ reflects a 0.3 chance that the facilities continue to operate independently and a 0.7 chance that they operate

[24] In practice, I estimate a more flexible form of Equation 1 where I replace the indicator for whether ΔHHI exceeds 1,000 with indicators for whether ΔHHI is greater than zero, greater than 750, and greater than 1,500. (This choice is merely to add flexibility; the reason for the threshold choices will become clear in the subsequent section.)

as observed. From 2010 to 2017, $HHI_i^\star$ reflects a 0.3×0.5 chance of observing each facility owned independently, a 0.7×0.6 chance of observing A own B, a 0.3×0.5 chance of A owning C, and a 0.7×0.4 chance of A owning B and C.

4.3 Effects on real outcomes

The final question is whether consolidation has real effects on the dialysis industry. Theory provides ambiguous guidance as to how firms will respond to rising concentration. On the one hand, mergers that consolidate ownership may induce scale economies, facilitate the sharing of (local) best practices, and provide a host of other benefits. Together these can improve care to patients and reduce the financial burden on payers while improving firm profits. On the other hand, consolidation reduces the ability of patients and payers to substitute. Consider the Del Rio, Texas example from the introductory section. Prior to the acquisition, competition provided potentially strong incentives to keep prices low and quality high. For example, were one provider to reduce clinical staff or operate fewer HD stations, thereby increasing wait times and inconveniencing patients, many might substitute to the rival facility. Following the acquisition, those incentives are eliminated. (Note that there is clearly scope for staff or station reductions to reduce costs and/or leave patient unaffected, especially in the event that acquiring firms on average use inputs more efficiently than acquired ones. The forthcoming data, including prices and health outcomes, will clarify this.) I employ a "triple-difference" (DDD) research design to measure the effect of premerger notification requirements on real outcomes. This approach relies on variation in merger size and premerger market structure, as described above, as well as variation in the timing of mergers. The reduced form estimating equation is given by

$$\begin{aligned} y_{ft} = W_{ft}\Gamma \; &+ I_f^{Ex} \; \beta_1 \; + I_t^{Post} \; \beta_2 \; + \Delta HHI_{ft} \; \beta_3 \\ &+ I_f^{Ex} \cdot I_t^{Post} \; \beta_4 \; + I_f^{Ex} \cdot \Delta HHI_{ft} \; \beta_5 \; + I_t^{Post} \cdot \Delta HHI_{ft} \; \beta_6 \; + I_f^{Ex} \cdot I_t^{Post} \cdot \Delta HHI_{ft} \; \beta_7 \; + \eta_{ft}. \end{aligned} \tag{2}$$

f denotes a facility for which an acquisition is proposed. t denotes the year. For simplicity, I consider a two year window around each merger, averaging observations in the "pre" and "post" period and omitting observations in the year of the merge. For instance, Davita acquired Gambro in 2005, so for each proposed facility acquisition, I discard t = 2005 and form a pre-acquisition observation from t = 2003 and t = 2004 and a post-acquisition observation from t = 2006 and t = 2007. I^{Ex} is an indicator for whether a merger is exempt from premerger notification requirements, i.e. it equals $1 - I^{HSR}$. W_{ft} denotes a vector of control variables, e.g. facility and/or time fixed effects. λ is the coefficient of

interest.

This approach assumes that error in the model is uncorrelated with the interaction of I^{Ex}, I^{Post}, and ΔHHI, conditional on the other right-hand side variables. That is, it requires that changes in y for small concentration changes relative to large concentration changes around the time of exempt facility acquisitions would otherwise be the same as those around reportable facility acquisitions (absent differential exposure to antitrust enforcement actions). Though the decision of which firm to acquire when constitutes an important, ongoing set of choices for firms, selection on the most obvious dimensions—exemption status and concentration change—is accounted for here. Moreover, alternative specifications that expand the window around each acquisitions and assess pre-trends seem to support these findings (though these are in process and not included in the current draft). In practice, a host of quasi-random factors appear to generate randomness in what facilities are offered for sale and when.[25]

5 Results

5.1 Enforcement

Figure I plots divestiture rates by exemption status and proforma HHI change, providing an initial sense of how divestitures respond to premerger notifications. Immediately striking is the wide gap in divestiture rates for reportable and exempt proposed facility acquisitions. Focusing attention on large proforma HHI increases, one sees aggressive enforcement among reportable mergers yet virtually nonexistent enforcement among exempt mergers—some initial evidence of stealth consolidation. *Many proposed facility acquisitions that would otherwise be blocked over 95% of the time are blocked less than 5% of the time when exempt.* These include mergers to duopoly and even monopoly, including the illustrative transaction that starts the paper.

[Figure I about here.]

Perhaps equally striking, divestiture rates fall to zero as proforma HHI changes fall below 750 regardless of exemption status, thereby narrowing the gap between reportable and exempt mergers to zero as well. Together these facts not only reveal just how sensitive agency actions are to market-level competitive effects but also indicate that the ownership and operational data provide comprehensive coverage, since they closely relate to the FTC divestiture data even as they are drawn from a different data source.

[25] Press releases indicate that factors driving facility sales range from the desire of a private equity firm to generate realized returns for its investors to the aging a parent company's founder.

To quantify this divergence, column 1 of Table III reports estimates for Equation 1. No divestitures are required of proposed exempt facility acquisitions resulting in small proforma HHI changes. Divestitures increase only slightly among exempt acquisitions resulting in large proforma HHI changes and among reportable acquisitions resulting in small proforma changes. Yet, they increase 86% for reportable acquisitions resulting in large proforma HHI changes. The coefficients are very precisely estimated, and despite at least some degree of misspecification, the R^2 value exceeds 70%.

[Table III about here.]

In more than half of the cases, the acquirer does not have a pre-existing location in that market. In those cases, proforma HHI increases are zero. To ensure that the main results do not hinge on comparisons at the extensive margin of consolidation, I re-estimate Equation 1 but limit the sample to non-zero proforma HHI increases. Column 2 reports that the coefficients are largely unchanged.

5.2 Market structure

When the divestiture rates estimated for proposed reportable facility acquisitions are in turn applied to proposed exempt facilities acquisitions, I find that, on average, 334 facility acquisitions affection 118 markets would have been blocked but for the exemption.[26] Since HHI is a non-linear function of the shares, computing counterfactual industry-wide average market structures requires first integrating over the probability that each facility requires a divestiture.[27]

Figure II reports the result of this exercise.[28] The solid line tracks the average HHI across markets by year. It provides a visual representation of the dramatic rise reported earlier in the summary statistics, from just over 2,500 to nearly 4,000. The dotted line, on the other hand, tracks the counterfactual market structure if the enforcement rates applied to proposed reportable facility acquisitions had been applied to all transactions. The measure increases over the sample less than 100 points. In other words, the aforementioned steep rise in observed concentration is drastically reduced.

[Figure II about here.]

[26] The coefficient estimates on which the predicted divestiture rates rely are found in the final two columns of Table III.

[27] HHI is non-linear in market shares, so the calculations are somewhat computationally intensive, even though they are straightforward. It requires enumerating and integrating out over 2^n possibilities, where n is the number of target facilities.

[28] The figure weights markets by their size. The Appendix replicates this figure but uses unweighted average HHI. The results are qualitatively the same.

5.3 Real outcomes

Odd-numbered columns of Table IV report the results from estimating Equation 2. As HHI rises, each of the care quality measures declines significantly more post-merger for exempt attempted facility acquisitions than for reported ones, consistent with structural estimates found in Eliason et al. [2018]. Stealth consolidation results in fewer nurses per technician, patients per employee, and patients per station.

[Table IV about here.]

As HHI increases, the effects on quality of care among reportable deals are much more muted, consistent with Cutler et al. [2016]. Moreover, none are statistically separate from zero, unlikely the prior coefficients, which were all significant at either a 1% or 5% level. Why do the coefficients in rows 1 and 4 differ? Most likely, quality of care is decreasing in concentration at an increasing (in absolute value terms) rate. In other words, the relationship may be highly non-linear.

To resolve this, I re-estimate Equation 2 but replace the continuous measure of concentration increases with indicators for whether proforma HHI changes fall in the interval (0,1000) or on the interval [1000,5000]. Even-numbered columns of Table IV reports those results. Across all measures of quality of care, it is clear that the effect of concentration loads on HHI changes greater than 1,000 points. Even more interesting, the coefficients on $I_t^{Post} \cdot I^{\Delta HHI>0} \cdot I^{\Delta HHI<1000}$ and $I_t^{Post} \cdot I^{Exempt} \cdot I^{\Delta HHI>0} \cdot I^{\Delta HHI<1000}$ are close, resolving the prior discrepancy. (Point estimates for $I_t^{Post} \cdot I^{\Delta HHI>1,000}$ and $I_t^{Post} \cdot I^{Exempt} \cdot I^{\Delta HHI>1,000}$ are not close, though the standard errors on the former are too large to draw any meaningful inference from, presumably reflecting the fact that very few reportable deals in which HHI increases exceed 1,000 are actually permitted.)

[Price and patient-level health outcome results in process.]

6 Conclusion

Despite clear difficulties in applying US antitrust law to domestic merger activity prior to the establishment of the premerger notification program, most transactions still fall outside the purview of the Act based on their size. These exemptions are likely innocuous for fragmented industries, in which large numbers of sellers exist. Yet, they are potentially dangerous for segmented industries. In theory, even

small mergers can induce large changes in market structure, and the sum of these "local" transactions can add up to meaningful industry-wide consolidation.

This paper shows this is not merely a theoretical concern. In the dialysis industry, hundreds of deals falling below the premerger notification threshold transferred ownership over thousands of facilities, which appeared to have effectively escaped antitrust scrutiny. Transactions were permitted that—were they subject to the premerger notification program and, in turn, prospective merger reviews—would have almost surely been blocked, with the authorities arguing these deals were illegal by Section 7 of the Clayton Act. The paper indicates that if exempt deals had been subject to the scrutiny that non-exempt deals receive, the rise in concentration might have slowed or even stalled. Moreover, it presents evidence that stealth consolidation has real effects.

More work is needed before these findings can guide policy in one direction over another. Perhaps the most natural alternative to the status quo involves lowering the thresholds for a set of well-defined segmented industries, e.g. those in the US healthcare sector. This paper indicates some benefit to doing so. It is silent, though, on the costs. These are required for optimal exemption calculations and depend on, among other things, the production function of the competition authorities and the regulatory burden on firms. Obtaining a better understanding of these is left to future research.

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Figures

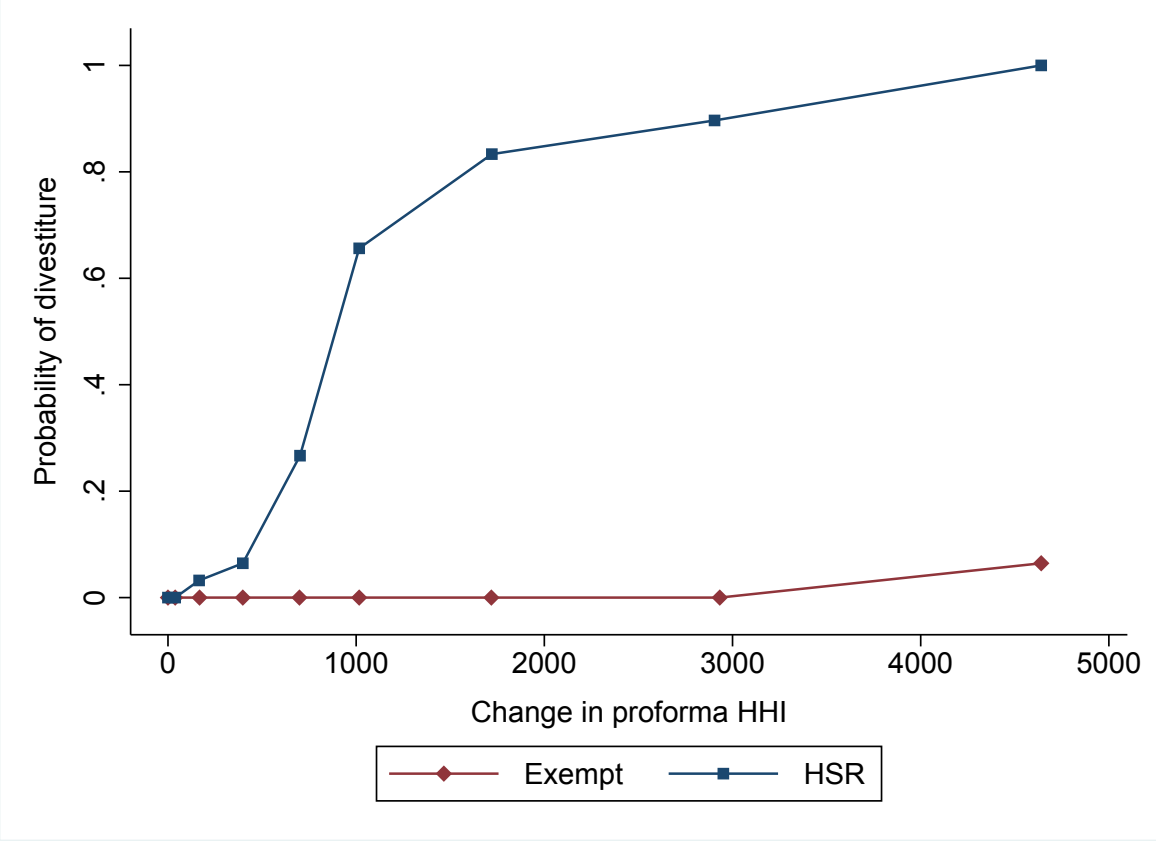


Figure I: *US enforcement aggressively pursues reportable mergers but rarely challenges exempt ones.*

This graph plots divestiture rates against proforma HHI changes, i.e. the amount HHI would increase were the proposed facility acquisition completed. The unit of observation is the merger-market (so a target firm operating in, e.g., five markets prior to the merger generates five observations regardless of how many facilities it operates in). Data are binned according to x-axis values, and within-bin averages are plotted. Points connected by the top line reflect enforcement among proposed facility acquisitions associated with reportable mergers; points connected by the bottom line pertain to exempt ones.

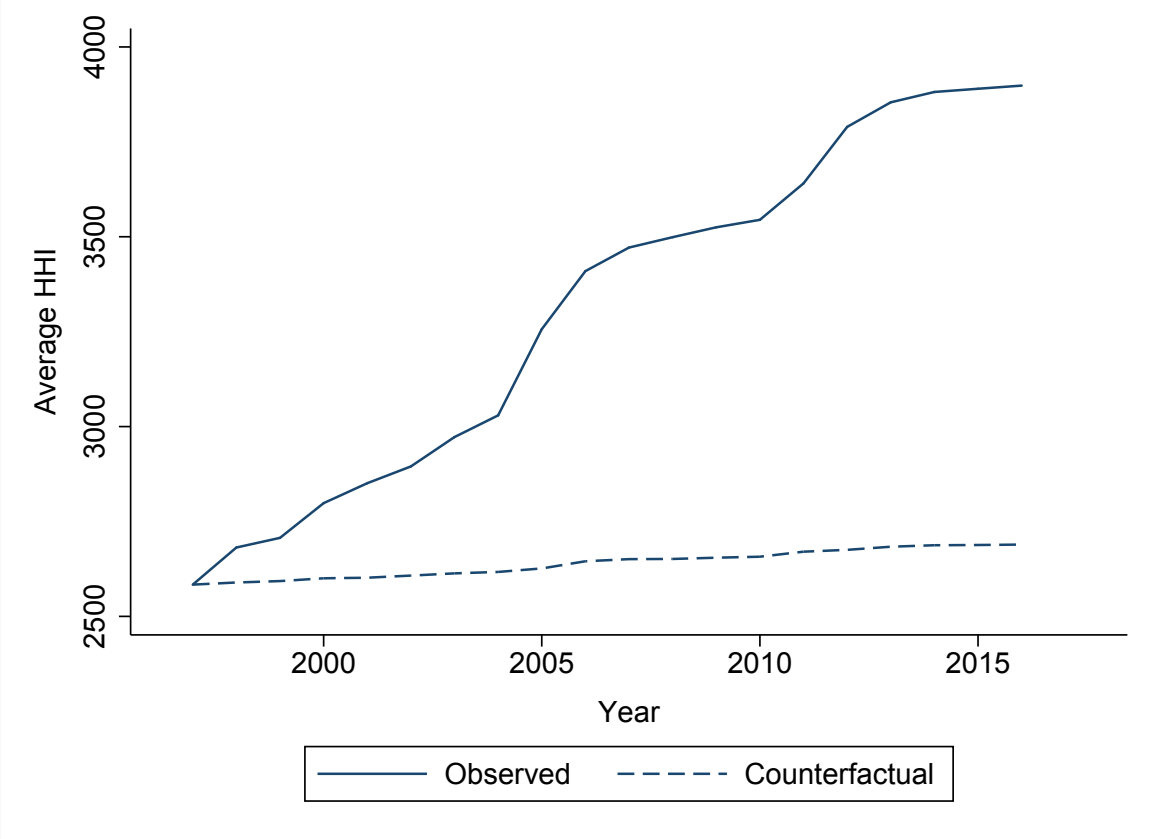


Figure II: *Subjecting exempt mergers to the scrutiny other mergers face eliminates the rise in industry concentration.*

This graph plots average within-market concentration over time. The top line tracks mean HHI as it actually evolved over the sample. The bottom line tracks 'counterfactual" mean HHI as it would have evolved were the divestiture rates estimated on non-exempt mergers faced by exempt ones.

Tables

Table I: *Summary of facilities*

	Facilities						
Year	Total	Large chain	Stations	Nurses	*1mm Patients	Markets served	Average HHI
1997	3,185	1,525	47,135	16,139	204,707	964	2,583
1998	3,356	1,751	51,175	24,313	218,676	1,008	2,681
1999	3,606	1,993	55,214	26,489	235,799	1,050	2,706
2000	3,795	2,233	59,654	28,482	250,961	1,082	2,798
2001	3,946	2,394	62,828	30,883	263,475	1,115	2,850
2002	4,127	2,572	67,805	33,284	280,113	1,143	2,895
2003	4,264	2,702	71,112	34,046	291,582	1,162	2,972
2004	4,444	2,923	74,904	35,793	304,797	1,196	3,029
2005	4,584	3,090	78,661	36,988	316,711	1,201	3,256
2006	4,729	3,288	81,707	36,531	327,270	1,219	3,409
2007	4,929	3,551	84,776	36,103	339,817	1,236	3,471
2008	5,126	3,768	88,831	40,233	355,651	1,264	3,498
2009	5,270	3,969	92,179	40,020	368,199	1,288	3,524
2010	5,435	4,194	96,211	47,207	382,136	1,300	3,544
2011	5,773	4,575	98,816	50,173	401,343	1,317	3,640
2012	5,752	4,635	98,480	50,173	400,239	1,312	3,789
2013	5,941	4,865	100,389	49,510	411,072	1,326	3,854
2014	6,204	5,180	103,583	53,622	426,991	1,335	3,881
2015	6,416	5,401	106,203	48,097	440,237	1,336	3,889
2016	6,694	5,672	109,571	49,304	454,154	1,342	3,898
2017	6,966	5,956	113,883	58,157	469,982	1,358	3,938

This table documents industry growth and consolidation. "Large chains" own thirty or more facilities. "Markets served" count the number for which there isat least one outpatient HD facility. "Average HHI" measures mean industry concentration across markets, weighted by the number of stations in the market.

Table II: *Summary of ownership changes*

	Facility acquisitions				
Year	Proposed total	Proposed exempt	Proposed reportable	Completed	Divestitures
1998	268	156	112	268	0
1999	105	91	14	105	0
2000	120	60	60	120	0
2001	116	116	0	116	0
2002	99	99	0	99	0
2003	83	83	0	83	0
2004	227	142	85	227	0
2005	741	178	563	677	64
2006	641	159	482	542	99
2007	126	126	0	121	5
2008	115	81	34	115	0
2009	55	55	0	55	0
2010	233	100	133	233	0
2011	324	210	114	301	23
2012	331	79	252	274	57
2013	130	78	52	130	0
2014	71	71	0	71	0
2015	87	87	0	87	0
2016	183	91	92	180	3
2017	119	68	51	112	7
Total	4174	2130	2044	3916	258

This table summarizes ownership changes by year. "Proposed total facility acquisitions" equal the sum of columns 3-4 and also the sum of columns 5-6.

Table III: *The effect of notification exemptions on enforcement.*

VARIABLES	(1) Divestiture	(2) Divestiture	(3) Divestiture	(4) Divestiture
I^{HSR}	.032***	.15***	-4.9e-16	
	(.0074)	(.033)	(3.0e-10)	
$I^{\Delta HHI>1{,}000}$	.027*	.027*		
	(.015)	(.015)		
$I^{HSR} \cdot I^{\Delta HHI>1{,}000}$	.83***	.71***		
	(.035)	(.048)		
$I^{\Delta HHI>0}$			-1.7e-15	.051***
			(.)	(.021)
$I^{\Delta HHI>750}$			.018	.51***
			(.018)	(.089)
$I^{\Delta HHI>1{,}500}$			.0062	.38***
			(.024)	(.095)
$I^{HSR} \cdot I^{\Delta HHI>0}$			.054**	
			(.024)	
$I^{HSR} \cdot I^{\Delta HHI>750}$			.53***	
			(.072)	
$I^{HSR} \cdot I^{\Delta HHI>1{,}500}$			.35***	
			(.073)	
Constant	5.8e-16	-4.4e-16	3.1e-16	5.2e-16
	(.)	(1.0e-09)	(3.0e-10)	(.)
Observations	1,370	459	1,370	671
R-squared	.71	.67	.78	.64
Acquirer present in market	No	Yes	No	No
Reportable mergers only	No	No	No	Yes

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The unit of observation is the merger-market. (For example, a target firm operating in five markets prior to the merger generates five observations regardless of how many facilities it operates). Column 1 reports estimates from Equation 1. Column 3 report estimates from re-estimating the equating, replacing $I_i^{Divestiture}$ with the proportion of target facilities for which divestitures are forced by the FTC. Columns 1 and 3 consider the full sample. Column 2 restricts the sample to cases where $\Delta HHI_i > 0$, i.e. the acquirer competes with the target facilities in the market prior to the acquisition. Column 4 restricts the sample to reportable mergers. Robust standard errors are reported in parenthesis.

Table IV: *The effect of stealth consolidation on care quality measures.*

VARIABLES	(1) Nurses/ techs	(2) Nurses/ techs	(3) Patients/ employees	(4) Patients/ employees	(5) Patients/ stations	(6) Patients/ stations
$I^{Post} \cdot I^{Exempt} \cdot \Delta HHI$	-.061**		-.24***		-.09***	
	(.027)		(.08)		(.02)	
$I^{Post} \cdot I^{Exempt} \cdot I^{\Delta HHI>0} \cdot I^{\Delta HHI<1000}$		-.041		-.13		-.047
		(.074)		(.22)		(.055)
$I^{Post} \cdot I^{Exempt} \cdot I^{\Delta HHI>1000}$		-.15**		-.61***		-.25***
		(.072)		(.21)		(.054)
$I^{Post} \cdot \Delta HHI$	-.023		-.069		-.013	
	(.019)		(.057)		(.015)	
$I^{Post} \cdot I^{\Delta HHI>0} \cdot I^{\Delta HHI<1000}$		-.033		-.088		-.041
		(.054)		(.16)		(.04)
$I^{Post} \cdot I^{\Delta HHI>1000}$		-.038		-.1		-.024
		(.10)		(.28)		(.11)
Observations	6,286	6,286	6,286	6,286	6,286	6,286
R-squared	.74	.74	.85	.85	.88	.88
Year FE	X	X	X	X	X	X
Facility FE	X	X	X	X	X	X

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The unit of observation is the facility-year. (For each facility, there is exactly one "pre-" and one "post-merger" observation.) Quality of care is measured in nurses per technician in columns 1-2, patients per employee in columns 3-4, and patients per station in columns 5-6. Odd-numbered columns report estimates from Equation 2. The even-numbered columns report analogous results, but restrict the sample to exempt proposed facility acquisitions and replace ΔHHI with an indicator for $\Delta HHI \in (0, 1000)$ and for $\Delta HHI \geq 1000$. For the sake of readability, I^{Post} and $I^{Post} \cdot I^{Ex}$ are not reported. Robust standard errors are reported in parenthesis.