Mergers and Rivals' Technology Adoption: Evidence from U.S. Dialysis*

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Abstract

We show that as mergers increase local market concentration in the U.S. dialysis industry, the merging firms' rivals differentiate in the technology they offer. Contrary to the antitrust concern that consolidation weakens innovation, these rivals adopt a superior technology. This differentiating technology is home hemodialysis, a survival-improving home therapy that the large in-center chains tend to underprovide. In the median-exposed market, a merger shock raises rivals' uptake by nearly a third of the pre-merger base (below two percent of patients). The rise is broad across the fringe. Among small and independent providers, home hemodialysis rises while total home dialysis is unchanged, a substitution away from peritoneal dialysis. The effect is local, fading beyond five miles of the merged firm. By typically focusing on the merging firms, merger review accounts for the harm from lost competition but not for this rival-response channel.

Key words: antitrust; competitive response; health care; horizontal mergers; market concentration; product differentiation; technology adoption

JEL classification: D22, G34, I11, I18, K21, L13, L41, O33

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1 Introduction

A merger changes the market for both the merging firms and their rivals. Facing a larger, better-capitalized competitor, a rival can withdraw from direct competition or differentiate into a technology that the merged firm is slow to adopt. Which effect dominates is not obvious, and the answer matters for how we judge mergers. The antitrust concern that consolidation weakens the incentive to invest in better care is a claim about the merging firms, not their rivals (Federico et al., 2018; Denicolò and Polo, 2019). In this paper, we ask how the rivals of a merging firm change the technology they offer when a merger concentrates their local market, and we examine it in the U.S. dialysis market.

A dominant firm is slow to adopt a technology that cannibalizes its existing business. The larger its installed base, the weaker its incentive to adopt, so it invests less than a rival with no such base to protect. This is akin to a replacement effect (Arrow, 1962). A rival can thus escape into the margin the firm does not serve (Aghion et al., 2005), a response that merger review overlooks. The standard welfare calculation accounts for the harm from lost competition, including the innovation theory of harm to the merging firms' own investment (Federico et al., 2018; Denicolò and Polo, 2019), but not an offsetting upgrade by rivals (Richards and Whaley, 2026; Dranove et al., 2022), so a merger that induces such an upgrade leaves that calculation incomplete. Whether competition drives innovation is a longstanding question, studied in theory and in observational, structural, and experimental work (Vives, 2008; Blundell et al., 1999; Igami, 2017; Aghion et al., 2018). What changes for a rival here is the strength of the single competitor it now faces, and a national merger that concentrates one local market at a time isolates that variation.

We study U.S. outpatient dialysis, a well-suited setting for this question. First, technology adoption is observed directly in facility-level Medicare reports. Second, competition is local, because a patient dialyzes three times a week and chooses among the facilities within a short travel radius of home (Gaynor et al., 2015). And third, the industry's consolidation was driven by national mergers whose incidence in any one local market is plausibly

unrelated to a single competitor's path. The transformative technology we track is home hemodialysis. It frees patients from the thrice-weekly clinic visit and is associated with better survival and quality of life (Weinhandl et al., 2012; Bonenkamp et al., 2020). However, home hemodialysis is capital-intensive and demands specialized patient training. With fewer than two percent of U.S. dialysis patients using it through our study period (though its use has since grown (United States Renal Data System (USRDS), 2023; Cutler et al., 2012)), it remains the exception. Adopting it means reorganizing how care is delivered rather than adjusting a quality margin. We therefore use home-hemodialysis uptake as a direct measure of *transformative* technology adoption.

Estimating a merger's effect from the merging firms themselves poses two problems, and studying their rivals avoids both. The first is selection before the merger. A firm is acquired for reasons tied to its own trajectory, so its pre-merger path is not chosen the way a bystander's is, and recovering the merger's effect on the acquired firm requires confronting that selection directly (e.g., Seru, 2014). A rival did not choose to have its competitor acquired, so its exposure is determined by whether the merging firms happened to operate near it, not by its own conduct. The second problem arises after the merger. A merger has asymmetric effects on the two groups (Motta and Tarantino, 2021). The merging firms experience both the change in market structure and merger-specific effects, notably the internal reorganization that follows the deal, while a non-merging rival experiences only the change in market structure. Studying the rivals, therefore, isolates the response to concentration (or changes in competition) from the reorganization associated with the merger.

We measure each market's concentration shock with a merger-simulation instrument. When two chains merge, the Herfindahl-Hirschman index of a market in which they hold pre-merger patient shares s_A and s_B rises, holding all other shares fixed, by $2\,s_A s_B$. We compute this predicted change from predetermined local shares and the national timing of the chain acquisitions that consolidated the industry between 2005 and 2016. Because the shock combines local shares fixed before the deal with a national corporate event, it is exogenous

to a rival's contemporaneous decisions (in the shift-share tradition (Goldsmith-Pinkham et al., 2020)). We estimate the rivals' response in a stacked difference-in-differences design (Cengiz et al., 2019) that compares never-acquired facilities whose local market is exposed to a merger with those whose market is not yet exposed, and we trace how the response decays with distance from the merged firm.

We find that concentration leads rivals to adopt home hemodialysis, the transformative technology, and interpret our results as evidence for an escape-competition mechanism. The response reaches across the rival fringe of independent facilities and regional chains: independents and chains, small and large facilities, all raise uptake. Among small and independent providers, it comes by substituting away from peritoneal dialysis, the easier home modality, toward home hemodialysis, most sharply where a rival holds the peritoneal-dialysis capacity to redeploy. It is local, vanishing beyond roughly five miles of the merged firm, and sizable. A concentration increase of the magnitude seen in the median exposed market raises a rival's home-hemodialysis uptake by nearly a third of its base rate. This represents a large move in a transformative technology that most facilities do not offer at all.

The finding qualifies the antitrust presumption. On the margin we study, consolidation raises rival technology adoption rather than weakening it. It also complements what is known about the merging firms themselves. Acquired dialysis facilities adopt their new owner's clinical routines, reflecting a standardization of practice that raises profitability and changes drug dosing and staffing (Eliason et al., 2020; Grieco and McDevitt, 2017). That is incremental, cost-oriented change *inside* the merged firm. We document the opposite margin *outside* it, where the rivals that remain take up the transformative technology rather than imitate the chain's routines.

This paper makes four contributions. First, it shifts the study of health-care consolidation from the acquired firm to its rivals, a shift that is both substantive and identifying, because a rival did not choose to be absorbed and thus avoids the acquisition-selection problem that confounds inference from merging firms. A large literature estimates how mergers

affect prices, quality, and the conduct of the merging parties (Richards and Whaley, 2026; Dranove et al., 2022; Eliason et al., 2020). We identify the technology response of the firms that do *not* merge, a margin central to the welfare analysis of any horizontal merger yet rarely measured, precisely because it is hard to measure on the merging parties themselves. The closest work measures rivals' prices and market power after mergers (Stiebale and Szücs, 2022) and the effect of mergers on innovation, in patents and R&D, at both merging firms and their rivals (Haucap et al., 2019). Neither is technology adoption, the margin along which firms upgrade when competition intensifies (Bloom et al., 2016), which is what we measure in the rivals of a merging firm.

Second, our paper informs merger policy in provider markets. The competitive-response channel we identify (rivals adopting a superior technology) is a welfare-relevant consideration that current merger-review practice, focused on the direct harm from lost competition, does not (always) weigh.

Third, the paper brings clean, local variation to the concentration-innovation question. We use a merger-simulation instrument, the design used to identify concentration effects in health-insurance and hospital consolidation (Dafny et al., 2012; Dafny, 2009), to show that a discrete rise in local concentration raises adoption of a specific, capital-intensive transformative technology across the rival fringe, with the differentiation (a substitution away from peritoneal dialysis toward home hemodialysis) concentrated among small and independent providers. That pattern is not read off the data after the fact. An escape-competition and replacement-effect logic singles out those firms in advance, and the response appears on the margin, in the firms, and over the geography that the mechanism predicts.

Fourth, our paper shows that the competitive response is spatially local and rival-specific. The rivals' adoption concentrates within roughly five miles of the merged firm and disappears beyond that. Our findings are therefore determined by proximity to the strengthened competitor rather than by market-wide changes in concentration. This geography reflects the mechanism directly. A facility cannot differentiate based on location, which

is fixed, or on price, which Medicare sets. Instead, it differentiates in the technology it offers, which is a vertical, quality-based differentiation (Shaked and Sutton, 1982, 1983). Moreover, it does so where competition is most direct, following the spatial logic of product differentiation (Hotelling, 1929; d'Aspremont et al., 1979; Salop, 1979). Our results also matter for how consolidation is screened. Merger review defines geographic markets at this local scale (Elzinga and Hogarty, 1973), and the uneven local incidence of a national merger is what identifies our effect (Dafny, 2009). A concentration measure defined at the market level can miss responses organized around which facilities are closest to one another.

The paper proceeds as follows: Section 2 describes market structure and technology in U.S. dialysis. Section 3 lays out a theoretical framework for the rivals' response. Section 4 describes the data. Section 5 sets out the empirical strategy. Section 6 presents the results, and Section 7 concludes. Appendix A collects additional falsification and robustness exhibits, and Appendix B details the data.

2 Market Structure and Technology Adoption in U.S. Dialysis

2.1 Industry and Technology

The U.S. outpatient dialysis industry treats roughly 550,000 patients on maintenance dialysis for end-stage renal disease (United States Renal Data System (USRDS), 2023). Patients differ in their *modality*, the method by which the dialysis is delivered. Most receive in-center hemodialysis, performed in a clinic three times a week (about 90 percent of patients in 2005 and still 82 percent in 2024). The rest dialyze at home, by either peritoneal dialysis or home hemodialysis. Dialysis patients are fewer than one percent of Medicare beneficiaries yet account for roughly seven percent of Medicare fee-for-service spending (United States Renal Data System (USRDS), 2023). These home modalities remain the exception, but they

Table 1: Dialysis Modality Mix, Selected Years

Modality (% of patients)	2005	2015	2024
In-center hemodialysis	90.4	87.6	82.4
Home hemodialysis	0.6	2.0	4.8
Peritoneal dialysis	8.4	10.0	12.5
Any home dialysis	9.0	12.0	17.3

Notes: Patient-weighted national shares (percent of dialysis patients treated) by modality, from the Dialysis Facility Reports. Home hemodialysis is the transformative technology studied in the paper; it remains a small minority throughout the sample, though it has grown over time.

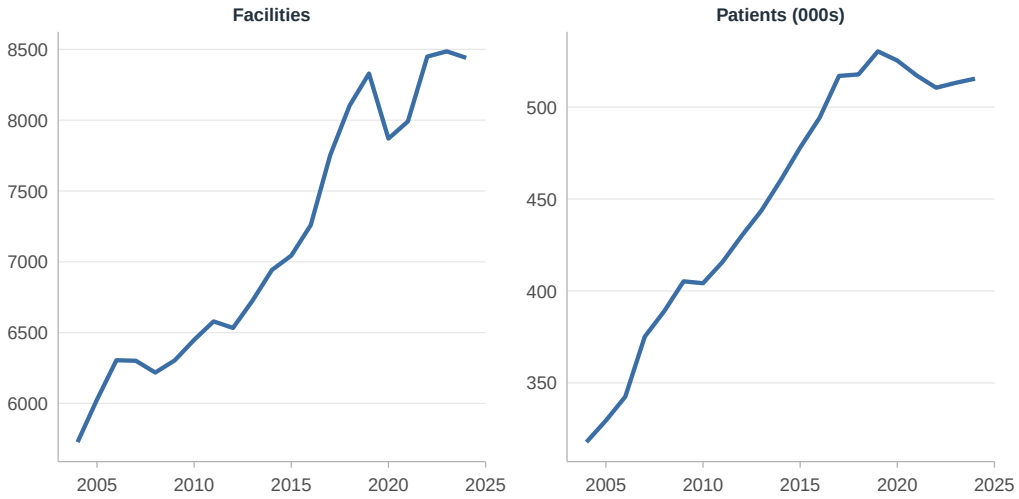
are not static. Peritoneal dialysis rose from 8.4 to 12.5 percent of patients between 2005 and 2024, and home hemodialysis, the industry's transformative technology, grew from 0.6 percent in 2005 to about 2 percent by the mid-2010s (the bulk of our study window) and 4.8 percent by 2024 (Table 1). Home hemodialysis is capital-intensive, training-intensive, and clinically demanding to deliver.

The industry has grown over the sample. Figure 1 plots the number of Medicare-certified facilities and the year-end prevalent patient census, both rising through 2024. The facility count grew by roughly half, from about 5,700 to 8,400, and the patient census by more than half. The concentration we study, therefore, came from acquisition rather than exit. Local markets grew more concentrated as the national chains absorbed rivals, even as the total number of facilities rose.

The industry is highly concentrated. Two large dialysis organizations, DaVita and Fresenius Medical Care, together treat a majority of U.S. dialysis patients, alongside a fringe of regional chains and independent facilities. This structure is the product of sustained horizontal consolidation. Between 2005 and 2016, a sequence of acquisitions absorbed rival chains into larger ones: DaVita's acquisitions of Gambro Healthcare (2005) and National Renal Institutes (2011),[1] Fresenius's acquisitions of Renal Care Group (2006) and Liberty

[1]In the CMS ownership data these clinics carry the brand "National Renal Institutes," the operating name of DSI Renal, the entity DaVita acquired in 2011; we label the deal by this data brand. Under the FTC's divestiture order, DaVita sold a subset of the clinics to a new entity that kept the DSI Renal name, and that U.S. Renal Care acquired in 2016. "DSI Renal" in the 2016 transaction, therefore, denotes a distinct set of clinics; the 2011 and 2016 cohorts' predetermined memberships are all but disjoint, sharing a single facility, so each enters the design as a separate concentration shock.

Figure 1: Industry Size, 2004–2024



Notes: Number of Medicare-certified dialysis facilities and the year-end prevalent patient census (sum of the point-prevalence modality counts). Facility counts for the most recent years understate the total because the Dialysis Facility Reports are reported with a lag; the decline after 2021 reflects this reporting lag, not a contraction of the industry. These years fall outside the merger event windows and are not included in the estimation.

Dialysis (2012), and U.S. Renal Care's acquisition of DSI Renal (2016) (Eliason et al., 2020; Dranove et al., 2022).[2] Table 2 lists the deals and the local markets each affected, and Figure 2 traces the resulting consolidation: DaVita and Fresenius together grew from about 41 percent of facilities in 2005 to 73 percent by 2024, while the independent share fell from 27 to 10 percent.

Dialysis competition is local. A patient dialyzes three times a week indefinitely and chooses among facilities within a short travel radius of home. The relevant market is a metropolitan area or a rural cluster, not the nation (Eliason, 2021; Grieco and McDevitt, 2017). A national merger, therefore, affects local markets unevenly. It sharply raises concentration in the local markets where both merging firms operate, leaving the rest unchanged. This uneven local incidence of a national corporate event is the variation we exploit.

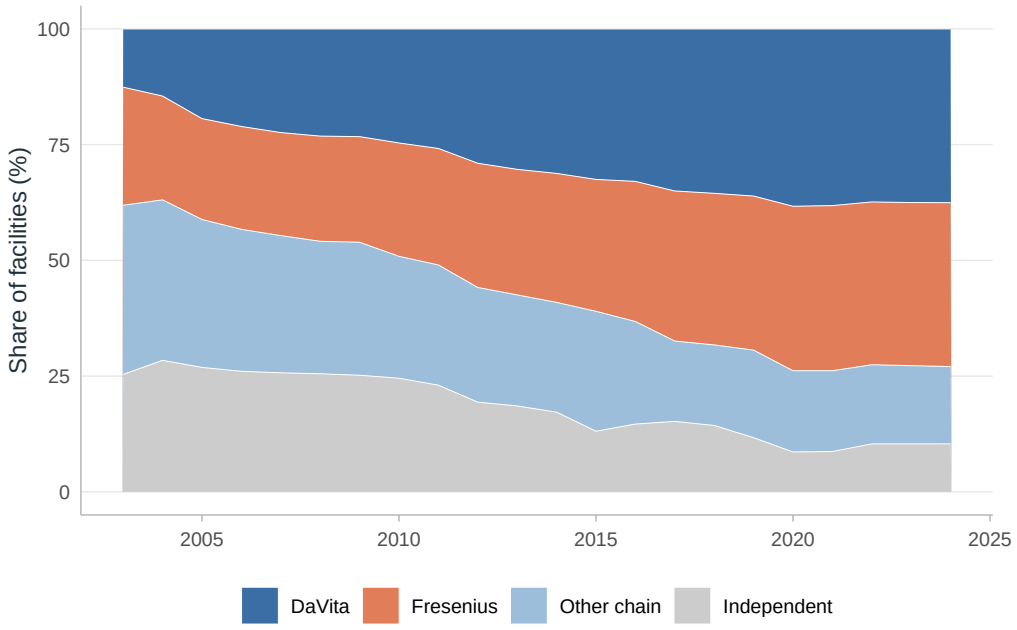
[2]The three largest of these deals (Gambro, Renal Care Group, and Liberty Dialysis) assembled the DaVita and Fresenius national chains and are the ones in which the Federal Trade Commission ordered divestitures. Our merger registry also includes a 2013 U.S. Renal Care acquisition that generated no local overlap between the merging parties; it therefore does not contribute to identification and drops out of the stacked design automatically, which is why leaving it out (Table A.1, Panel D) does not move the estimate.

Table 2: Horizontal Mergers Used as Concentration Shocks

Acquirer	Target	Year	Facilities absorbed	Overlap markets	Median $\widehat{\Delta\text{HHI}}$
DaVita	Gambro	2005	564	69	1,774
Fresenius Medical Care	Renal Care Group	2006	429	63	2,906
DaVita	National Renal Institutes	2011	55	15	219
Fresenius Medical Care	Renal Advantage/Liberty Dialysis	2012	170	37	934
U.S. Renal Care	Innovative Dialysis Systems/Ambulatory Services	2013	22	0	–
U.S. Renal Care	DSI Renal	2016	69	3	323

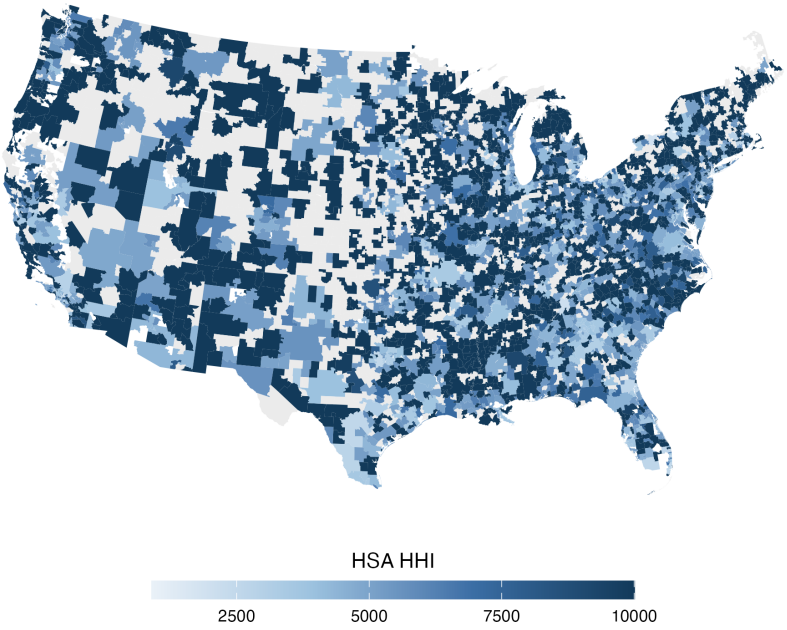
Notes: Facilities absorbed: target facilities in the panel at the pre-merger baseline year. Overlap markets: HSAs where both parties operate (predicted $\widehat{\Delta\text{HHI}} > 0$). Median predicted $\widehat{\Delta\text{HHI}}$ over overlap markets.

Figure 2: Consolidation into the DaVita/Fresenius Duopoly



Notes: Share of Medicare-certified dialysis facilities by firm group, 2003–2024, with the four shares summing to 100 percent each year. The shares are of facility counts, not patients. DaVita and Fresenius Medical Care appear separately. "Other chain" collects regional and smaller national chains, and "Independent" denotes facilities unaffiliated with any chain. The series begins in 2003, the first year chain identity is reliably resolved in the CMS ownership records.

Figure 3: Local Market Concentration



Notes: Market Herfindahl-Hirschman index by hospital service area for the contiguous United States, 2019. The index is on the 0–10,000 scale, with each independent facility treated as its own firm. Darker shading marks more concentrated markets, ranging from areas with several competing providers to near-monopolies. Hospital service areas with no reporting facility appear in light grey. Alaska, Hawaii, and the territories are omitted.

Local dialysis markets are highly concentrated. Figure 3 maps the market Herfindahl index by hospital service area in 2019. More than half of these markets are served by a single firm, and almost all fall within the range the merger guidelines classify as highly concentrated (U.S. Department of Justice and Federal Trade Commission, 2010, 2023). Competition is confined to a minority of markets, most of them urban, and it is there, where two national chains overlap, that the mergers we study raise concentration further.

3 A Framework for the Rival Response

A merger that concentrates a local market strengthens one competitor at the expense of the rest. A fringe rival that can no longer match the enlarged firm on price or scale has reason to differentiate rather than compete directly, moving into a technology the enlarged

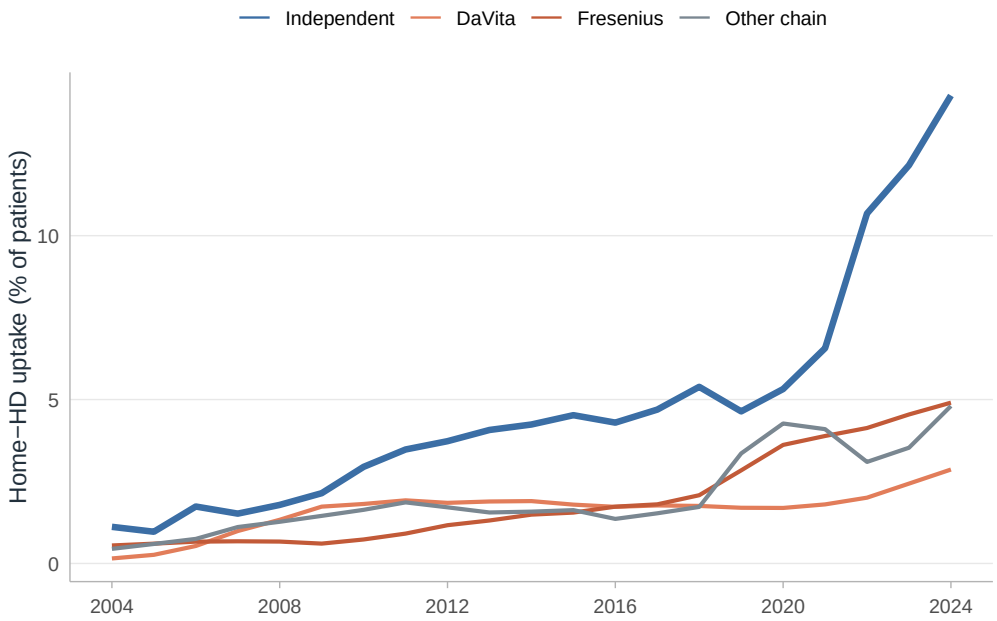
firm is unlikely to adopt (Aghion et al., 2005). Differentiation pays only if the enlarged firm does not follow, and whether it follows depends on its own incentive to adopt. A firm with a large installed base in an established technology earns little from a new technology that would displace that base, so it adopts more slowly than a rival with no such base to protect. This is the *replacement effect* (Arrow, 1962).[3] The two effects work in the same direction. Escape from competition gives the fringe rival a motive to differentiate, and the replacement effect identifies the technology the enlarged firm will leave to it. We call the change in a non-merging firm's technology adoption, when a merger concentrates its market, the *competitive response*.

What drives the response is the strength of the particular competitor a firm now faces. A merger raises concentration, which in isolation would soften competition and weaken the incentive to invest (Richards and Whaley, 2026). It does so, however, by replacing a set of comparable competitors with a single larger and better-capitalized one, against which a fringe firm cannot compete directly in the established technology. It is this stronger rival, rather than the change in the firm count, that raises the value of moving into a technology the enlarged firm will not adopt. Moreover, when competition is local, so is the pressure. It is greatest for the firms nearest the strengthened competitor and fades with distance from it.

Two features of a technology determine whether it can serve as the escape. The first is its *defensibility*: how far it separates the rival's product from the enlarged firm's, and how weak the enlarged firm's incentive is to match it. Defensibility is highest where the technology most directly displaces the enlarged firm's installed base, because that is where the replacement effect most weakens its incentive to follow (Reinganum, 1981; Christensen, 1997). The replacement effect is not the only force. A dominant firm may instead preempt, and whether it does turns on the balance between the replacement effect and the efficiency ef-

[3]Structural evidence that an incumbent rationally delays an innovation that cannibalizes its installed base is provided by Igami (2017) for the hard-disk-drive industry, where the threat to existing products slows incumbents' adoption of the new technology; Igami and Uetake (2020) trace how the same incentive shapes innovation and entry around mergers.

Figure 4: The National Chains Underprovide Home Hemodialysis

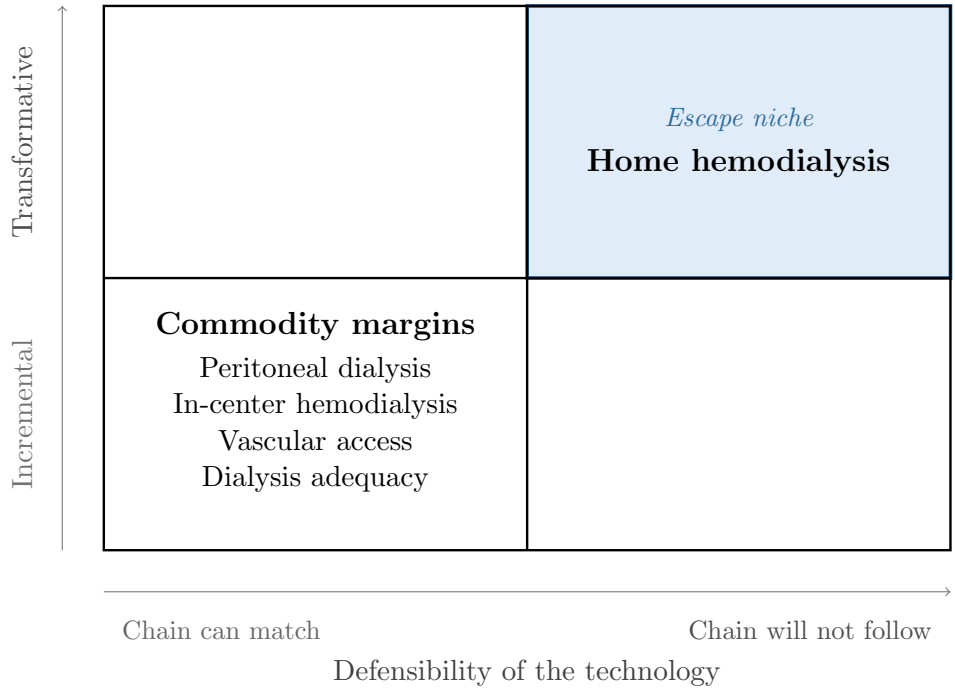


Notes: Patient-weighted home-hemodialysis uptake by firm group, 2004–2024. Each firm group's series is the share of its patients on home hemodialysis, with facilities weighted by patient count. The window opens in 2004, when the Dialysis Facility Reports first record modality. U.S. Renal Care is omitted, having too few facilities before 2010 to be reliable, and its facilities are excluded rather than pooled into "Other chain."

fect stressed in the persistence-of-monopoly literature (Gilbert, 2006). The second is whether the technology is *transformative* or *incremental*, the established distinction between an innovation that reconfigures how a service is delivered and an adjustment to an existing one (Henderson and Clark, 1990; Christensen, 1997). A transformative technology is a discrete, capital-intensive investment that establishes a durable new capability and a distinct product line. An incremental one is a quality margin that any competent firm can adjust. Only a transformative technology can anchor a differentiation strategy, because a large, hard-to-reverse investment is itself a credible commitment to the niche (Sutton, 1991), whereas a margin available to every firm sets none apart. The rival's best escape is a technology that is at once transformative and defensible.

Dialysis makes these features observable. A dialysis facility cannot differentiate by location (which is fixed) or by price (which Medicare administers), so any differentiation

Figure 5: The Escape Niche: A Technology Must Be Transformative and Defensible



Notes: Two features determine whether a technology can anchor a rival's differentiation. *Defensibility* (horizontal axis) is how far the technology separates the rival from the merged chain and how weak the chain's incentive is to match it, greatest where the technology most displaces the chain's in-center installed base. Whether the technology is *transformative* or *incremental* (vertical axis) depends on whether adopting it is a discrete, capital-intensive investment or an incremental improvement in quality. Only a technology that is both (i.e., home hemodialysis) offers a durable escape. Peritoneal dialysis, in-center hemodialysis, vascular access, and dialysis adequacy are matchable, adjustable, or both. The shaded cell is where predictions H1–H4 apply.

runs through the *modality* it offers, and facilities report their modality mix to Medicare. The modalities differ sharply in terms of defensibility and whether they are transformative or incremental. Figure 5 places each on these two dimensions.

Peritoneal dialysis and home hemodialysis are both home therapies that a coarser home-versus-clinic measure would conflate, yet they differ sharply in defensibility. Peritoneal dialysis is inexpensive, long-established, and only a weak substitute for in-center care, so a chain can add it at low cost, and its replacement barrier against it is slight. Differentiating into it escapes nothing, because the chain can adopt it just as readily. Home hemodialysis is the opposite. It is hemodialysis performed at home, the closest substitute for the chain's in-center product and thus the technology its installed base most discourages it from providing, so a

fringe facility that adopts it can expect the chain not to follow. Home hemodialysis is also transformative, where peritoneal dialysis is incremental: Establishing it is a discrete, capital- and training-intensive investment. Of the technologies a facility can offer, home hemodialysis alone is both transformative and defensible. Peritoneal dialysis, in-center hemodialysis, and the quality margins of vascular access and dialysis adequacy are not. Figure 4 confirms the premise that the mechanism requires: Throughout the sample, the national chains provide only about half the home-hemodialysis uptake of the independent facilities, the underprovision that leaves the technology available to a fringe rival.

Three features of the setting sharpen the predictions. First, establishing home hemodialysis is a large, discrete investment, so a rival responds faster by scaling an existing program than by starting one. The response should fall on the intensive margin rather than the extensive one. Second, the move into home hemodialysis is funded by redeploying existing home-care capacity, so it should concentrate in facilities with peritoneal-dialysis capacity to reallocate to small and independent providers. Third, the defensibility of the niche depends on the merged firm's commitment to in-center care. This implies that the larger its installed base, the stronger the replacement barrier and the more defensible the niche.

The mechanism and these features yield four predictions for the response of a never-acquired facility to a merger-predicted increase in the concentration of its local market. Figure 5 organizes the predictions: H1–H3 concern where in the technology space rivals move, and H4 where in geography.

H1 (Targeted differentiation). Concentration raises rivals' home-hemodialysis uptake, and not their peritoneal dialysis, in-center hemodialysis, vascular access, or dialysis adequacy. The rise is on the intensive margin, among facilities that already offer home hemodialysis.

Home hemodialysis is the one modality that is both transformative and defensible, the escape niche in the upper right of Figure 5. A rival gains durable separation there and not on the other margins, which the merged firm can readily match.

H2 (Recomposition). Total home dialysis is unchanged, and its composition shifts from peritoneal dialysis to home hemodialysis, mostly in small and independent facilities with the most baseline peritoneal-dialysis capacity to redeploy.

Establishing home hemodialysis draws on the home-care capacity a peritoneal-dialysis program already has, so a rival funds the upgrade by redeploying that capacity rather than by expanding home care. In Figure 5 this is the move from the commodity margins to the escape niche.

H3 (Defensibility). The home-hemodialysis response is larger where the merged firm's baseline in-center patient share is higher.

The niche is more defensible the larger the merged firm's in-center installed base, since that is what home hemodialysis would cannibalize. Greater defensibility places the technology further to the right in Figure 5.

H4 (Locality). The home-hemodialysis response is strongest for facilities closest to the merged firm and declines to zero with distance.

Competition in dialysis is local, so the response is strongest for the rivals nearest the merged firm and fades with distance from it.

Together, the four predictions describe one strategy: A rival meets consolidation by upgrading the differentiated part of its practice to its most defensible form and leaving the commodity segment unchanged. Section 6 tests each in turn.

Three features make the industry well-suited to studying this response. First, technology adoption is observed directly at the facility level. Second, markets are local and well-defined. Third, the consolidation was driven by national mergers whose incidence in any one local market is plausibly unrelated to a single competitor's trajectory. We build the empirical strategy on these three features.

4 Data

We construct a facility-by-year panel of every Medicare-certified U.S. dialysis facility from 1994 to 2024, comprising 190,772 facility-years across 10,528 facilities. The panel merges three administrative sources on the six-digit CMS facility identifier. The Dialysis Facility Reports and Care Compare files report patient counts by modality, clinical quality, and case-mix from 2004 onward. The CMS-265 renal cost reports provide treatment stations, treatment counts, staffing, dialyzer use, and facility financials from 1994 onward (Centers for Medicare & Medicaid Services (CMS), 2011, 2024). CMS ownership and Provider-of-Services records identify each facility's chain affiliation over time. The unit of observation is the facility-year.

We assign each facility to a parent firm through a harmonized chain-ownership crosswalk that resolves name variants and dates every ownership transition, so that a firm's identity is consistent across corporate renames and each acquisition takes effect in the year it closed. Independent facilities enter as distinct firms. We place each facility in a local market using the Dartmouth Atlas hospital service area (The Dartmouth Atlas Project, 2019), and we geocode facilities to ZIP-code centroids to measure the distance between competing facilities. For the heterogeneity and robustness analyses, we classify a focal facility as *independent* if it is unaffiliated with any chain when it enters the panel and as *chain* otherwise; as *small* if its baseline patient census lies below the focal-sample median and as *large* otherwise; and as *urban* if its ZIP code lies in a metropolitan or micropolitan commuting area (rural–urban commuting-area codes 1–6).

Our primary outcome is home-hemodialysis uptake, the share of a facility's patients receiving home hemodialysis.[4] Our primary measure is the patient share, which captures

[4]The modality shares are the Dialysis Facility Report's point-prevalence measures: for each modality, the share of a facility's patients on dialysis as of December 31 (the DFR prevalent-patient block, of which home hemodialysis is the `modhhd` field). The denominator is thus the facility's year-end prevalent census, the standard modality-share denominator, and the same point-prevalence frame used by the United States Renal Data System (United States Renal Data System (USRDS), 2023). Because it is a December-31 snapshot, within-year turnover is not captured: A facility is measured once, at year's end. This is distinct from the

Table 3: Descriptive Statistics, Estimation Sample

Variable	N	Mean	SD	P25	Median	P75
Home HD uptake (%)	18,532	2.08	8.89	0.00	0.00	0.00
Peritoneal dialysis (%)	18,532	11.68	22.10	0.00	0.54	13.39
Any home dialysis (%)	18,532	13.76	24.90	0.00	1.56	15.86
Fistula (%)	18,382	53.92	16.88	43.98	55.64	65.98
Catheter (%)	18,382	25.26	13.71	15.85	22.81	32.13
Kt/V (adequacy)	9,289	1.60	0.11	1.53	1.59	1.66
Patients	21,543	97.15	81.21	38.00	80.00	136.00
Market HHI (HSA)	21,436	5,234	2,604	3,292	5,000	6,406

Notes: Facility-year observations in the stacked estimation sample: never-acquired focal facilities in markets that fall within the event window of at least one merger, whether exposed to a merger or serving as not-yet-exposed controls. HHI on a 0–10,000 scale with each independent facility treated as its own firm.

how far a facility shifts its practice toward the home technology. We also decompose the response into an extensive margin, whether a facility offers the technology at all, and an intensive margin, the share among facilities that already offer it (Section 6). We also examine peritoneal dialysis, any home dialysis, in-center hemodialysis, vascular-access practice, and dialysis adequacy, so that the modality response can be read against the other clinical margins a facility can adjust. Table 3 reports descriptive statistics for the estimation sample: the never-acquired focal facilities that fall within the event window of at least one merger, some 18,500 to 21,500 facility-years. The clinical fields are incompletely reported: Dialysis adequacy (Kt/V) is available for roughly half of these facility-years and the vascular-access shares for nearly all.

5 Empirical Strategy

We identify the competitive response to consolidation by comparing facilities whose local markets were differentially exposed to a national merger. The design turns on the distinction between the firm that is acquired and the firms that compete with it. A facility that is itself acquired is bought for reasons tied to its own trajectory, so its post-acquisition path

facility's annual patient count (the DFR `allcnt` field), a period count of everyone treated during the year, which we do not use as an outcome denominator.

confounds the effect of ownership with the selection that produced the deal. A rival facility nearby is different. Its exposure to the merger is set by whether the two merging firms happened to operate nearby, not by its own conduct. We therefore study the rivals rather than the acquired firms.

5.1 The Merger-Simulation Instrument

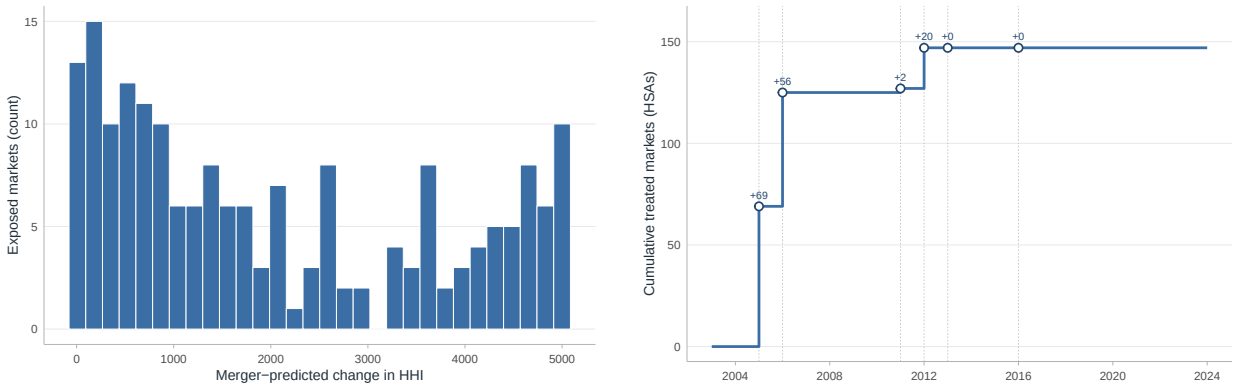
We measure each facility's exposure by the concentration shock its local market mechanically inherits from a national merger. When firms A and B merge, the Herfindahl-Hirschman index of a market in which they hold pre-merger patient shares s_A and s_B rises, holding all other shares fixed, by

$$\widehat{\Delta\text{HHI}}_{m,g} \;=\; 2\, s^{\text{pre}}_{A,m}\, s^{\text{pre}}_{B,m} \times 100^2, \tag{1}$$

the standard merger-simulation change in concentration, with shares expressed as fractions so that the dose is in index points on the 0–10,000 scale. This naive change in the Herfindahl index is the concentration screen long applied in the U.S. merger guidelines (U.S. Department of Justice and Federal Trade Commission, 2010, 2023), and Nocke and Whinston (2022) show that such a screen carries real economic content under standard models of oligopoly. We repurpose it as a continuous, market-specific measure of the shock each merger delivers to local concentration. We compute this *merger-predicted dose* for every local market m and every merger g, using patient shares measured in the last year before the deal closed.[5] Equation (1) combines predetermined local shares with the national timing of the merger, so the dose reflects a facility's inherited market structure rather than its contemporaneous choices. The construction is a merger-simulation instrument in the shift-share tradition: The shares are local and predetermined, and the shift is a national corporate event (Goldsmith-Pinkham et al., 2020). Figure 6a shows how the predicted dose is distributed across exposed markets. Most receive a modest concentration shock, with a right tail of markets in which the

[5]The Renal Care Group acquisition is the exception: because the acquired chain's local patient share is already zero in the 2005 ownership data, we measure its baseline in 2004, the last year its predetermined local share is observed.

Figure 6: The Merger-Predicted Treatment: Intensity and Rollout



(a) Distribution of the concentration shock **(b)** Staggered rollout of exposure

Notes: Panel (a) is a histogram of the merger-predicted change in market Herfindahl index, $\widehat{\Delta\text{HHI}}_{m,g} = 2\, s^{\text{pre}}_{A,m} s^{\text{pre}}_{B,m} \times 100^2$, across exposed markets (those with positive overlap between the merging chains). Panel (b) plots the cumulative number of local markets (hospital service areas) exposed to a chain merger through the end of the sample. Circles mark each merger event, labeled with the number of markets it first exposes, and the 2013 and 2016 acquisitions add none because their overlapping markets were already exposed by earlier deals. Each market is counted once, at its first exposure, so markets exposed by more than one merger are not double-counted. Of the 147 exposed markets, the 146 in the continental United States appear in the maps of Figures A.1 and A.2. The remainder lies in Alaska or Hawaii.

merging chains overlapped heavily. Positive dose reaches 147 local markets in all. Because each market is exposed at its first merger, four of the deals (Gambro, Renal Care Group, National Renal Institutes, and Liberty Dialysis) first expose markets and account for all 147, while the 2013 and 2016 acquisitions fall entirely on markets already exposed. Figure 6b traces this staggered rollout, with the count of exposed markets rising in steps as each deal closes and the four early deals accounting for all 147.

We estimate the response with a stacked difference-in-differences design (Cengiz et al., 2019). For each merger we form a cohort. The treated units are the never-acquired facilities in exposed markets; the clean controls are never-acquired facilities in markets not yet exposed to any merger within the event window.[6] Markets never exposed to any merger are clean controls in every cohort; a market exposed only by a later merger is a clean control for the

[6] A *never-acquired* focal facility is one the chain-ownership crosswalk never assigns to DaVita or Fresenius (the acquiring chains whose deals generate the identifying variation) and that is unaffiliated with a merging party in its first observed year. The party criterion is thus applied at entry, so a facility that competes as an independent when the identifying mergers occur remains a focal rival even if it later affiliates with a chain.

earlier cohorts whose windows close before it is exposed; an already-treated market never serves as a control. We stack the cohorts and estimate

$$y_{i,g,t} \;=\; \beta \left(\text{Post}_{g,t} \times \widehat{\Delta\text{HHI}}_{m(i),g}\right) \;+\; \alpha_{i,g} \;+\; \lambda_{g,t} \;+\; \varepsilon_{i,g,t}, \tag{2}$$

where $\alpha_{i,g}$ and $\lambda_{g,t}$ are facility-by-cohort and year-by-cohort fixed effects, so each merger is identified only against its own clean controls. The coefficient β measures the change in adoption per unit of predicted concentration. We trace the dynamics with an event study relative to the year before each merger. Because the treatment is a continuous dose, we corroborate the estimate with the heterogeneity-robust continuous-treatment estimator of de Chaisemartin and D'Haultfœuille (2026), verify that the fixed-effects coefficient is not an artifact of negative weighting (de Chaisemartin and D'Haultfœuille, 2020), and report the binary-exposure estimators of Callaway and Sant'Anna (2021) and Sun and Abraham (2021) for comparison.

Because competition is local and administrative market boundaries are coarse, we complement the market-level dose with a distance-based measure of exposure. For each facility we rebuild the dose of equation (1) from distance-weighted local shares. The merging parties' pre-merger patient shares are computed over all facilities within 50 miles of the focal facility, excluding the facility itself, with each competitor's patients discounted by an exponential distance-decay kernel ($e^{-d/15}$, where d is the distance in miles between ZIP-code centroids), so that exposure is largest for the facilities closest to the merged firm. A facility counts as exposed if a merging-party facility operates within 30 miles. We estimate the same stacked design with this distance-based dose and re-estimate the response separately for facilities whose nearest merging-party facility lies zero to five, five to ten, and ten to twenty miles away, each band against the same clean-control pool. These bands trace how far the competitive response reaches, and the decay of the response with distance is a direct test of the competitive mechanism.

We report the reduced-form dose response, the event-study path, and how the response decays with distance. We conduct inference by clustering on the local market, the level at which the merger-predicted dose is assigned (Abadie et al., 2023). The estimation sample spans 806 market clusters. At the more conservative level we cluster on the state, and we complement analytic standard errors with permutation tests that reassign the merger-predicted dose across markets within each cohort, a design-based check that does not rely on asymptotics in the number of clusters. We assess parallel trends through the pre-merger event-study coefficients and a test of whether the merger-predicted dose predicts a facility's pre-merger home-hemodialysis trend.

5.2 Identifying Assumption and Threats

The identifying assumption is that, conditional on the fixed effects, a market's merger-predicted dose is unrelated to the counterfactual path its rivals' technology would have followed absent the merger. Because the dose in equation (1) is built from predetermined shares and a national event, the assumption can fail in only one way that matters: if the shares that generate a large dose are correlated with a market's latent home-hemodialysis trajectory. This is the exclusion restriction of a shift-share instrument, which applies to the exposure shares rather than to the aggregate shock (Goldsmith-Pinkham et al., 2020; Borusyak et al., 2022). A market where the two merging chains held large overlapping shares differs from others in ways (urbanization, patient case-mix, an ongoing shift toward home care) that also shape adoption. The dose is nonrandom by construction, which is not the concern. The threat is that its predetermined determinants proxy for a home-hemodialysis path already underway.

We assess this threat directly. We test whether the dose is balanced on predetermined market characteristics, and whether the estimated response survives once markets that differ on those characteristics are allowed their own adoption trajectories. A response driven by the shares would not survive. We show that the dose does not predict a facility's pre-merger

home-hemodialysis trend, and that the pre-merger event-study coefficients are flat. A second threat, specific to dialysis, is mechanical. The Federal Trade Commission conditioned these mergers on divestitures, and a clinic divested into a rival's market could raise measured home-modality capacity without any behavioral response. We isolate this channel by re-estimating with divestiture-recipient facilities and their markets removed.

A third potential source of bias is measurement error in the outcome. The modality shares are December-31 point-prevalence measures (Section 4), so a facility with high within-year turnover is captured only by its year-end census, adding noise to the left-hand side. Because this snapshot convention does not depend on a market's merger exposure, any such error is plausibly classical. It inflates standard errors but does not bias the dose coefficient.

A final assumption is that a market's outcome depends on its own exposure and not on other markets': the stable-unit, no-interference condition. It can fail if home-hemodialysis demand, or the specialized staff to deliver it, spills across market boundaries, so that a not-yet-exposed control bordering a treated market is itself partially treated. The adjacent-market placebo we report, which replaces a market's own dose with the average dose of its bordering hospital service areas, is in fact positive, indicating some spillover to nearby rivals. Such spillover contaminates the controls in the same direction as the treatment, so it biases the difference-in-differences estimate toward zero. Our coefficient is, if anything, a lower bound on the rival response. A donut check gauges the contamination directly. Excluding every control facility in a market bordering a treated market leaves the estimate essentially unchanged, at 0.320, so the attenuation is real but small (Table 10). The estimand is accordingly a partial-equilibrium rival response (how a facility's own adoption moves with the concentration of its local market), not a general-equilibrium reallocation of patients across markets. Section 6 reports each of these checks.

6 Results

6.1 The Competitive Response

Concentration leads rivals to adopt the transformative technology. Table 4 reports the stacked difference-in-differences estimates. A merger-predicted increase of 1,000 points in the local Herfindahl index raises a rival facility's home-hemodialysis uptake by 0.310 percentage points (column 1), significant at the five-percent level under market clustering and at the ten-percent level under the more conservative state clustering. The shocks these mergers produce are larger. The median exposed market's Herfindahl index rises by about 1,555 points, so the typical increase in home-hemodialysis uptake is roughly half a percentage point, nearly a third of the pre-merger base rate and a large movement in a technology most facilities do not offer (Table 5).[7] Given the survival advantage associated with the therapy (Weinhandl et al., 2012; Bonenkamp et al., 2020), a shift of this size is clinically meaningful. Because demand and specialized staff spill across nearby markets and contaminate the controls toward treatment, this magnitude is, if anything, a lower bound on the rival response (Section 5.2).

The response is specific to home hemodialysis. The same shock does not raise peritoneal dialysis, the other home modality. Its market-level point estimate is negative, though imprecise (column 2). The combined *any-home* share and in-center hemodialysis are precisely estimated zeros, each within a fraction of a percent of its base rate (columns 3 and 4).[8] Rivals do not expand home care in general. They take up the one modality that a large, in-center-focused chain is slowest to provide.

Table 5 expresses every margin on a common scale, the coefficient as a percentage of the outcome's pre-merger base, both per 1,000 Herfindahl points and at the median

[7] We scale effect sizes by the pre-merger mean of the outcome (1.68 percent for home-hemodialysis uptake, over the stacked estimation rows), the level the coefficient is estimated against; the mean over distinct focal facility-years is 2.08 percent (Table 3).

[8] The fistula point estimate (column 5) is also positive, though small and imprecise under market clustering, and catheter use does not respond; the vascular-access and adequacy responses are set against home hemodialysis on the common scale of Table 5 and reported in Appendix Table A.2, where the adequacy decline, though precisely estimated, is an order of magnitude below any clinically meaningful difference. We keep home hemodialysis as the focal outcome because it is the transformative margin the paper is about.

Table 4: Competitive Response to Merger-Induced Concentration

Outcome:	Home HD	PD	Any home	In-center HD	Fistula
Post × $\widehat{\Delta\text{HHI}}$	0.310**	-0.368	-0.058	0.081	1.053
	(0.158)	(0.333)	(0.404)	(0.422)	(0.665)
State-clustered p	[0.100]	[0.331]	[0.896]	[0.866]	[0.079]
Facility×cohort FE	Yes	Yes	Yes	Yes	Yes
Year×cohort FE	Yes	Yes	Yes	Yes	Yes
Pre-merger mean	1.68	9.85	11.54	87.76	51.83
Observations	54,628	54,628	54,628	54,628	55,055
Market clusters	806	806	806	806	820

Notes: Each column is a separate stacked difference-in-differences regression of the outcome on Post × the merger-predicted change in market HHI (per 1,000 points), with facility-by-cohort and year-by-cohort fixed effects. Standard errors clustered on the market (HSA) in parentheses; state-clustered p-values in brackets. *Pre-merger mean* is the mean over the pre-merger rows the coefficient is estimated against; economic magnitudes are in Table 5. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

exposed-market dose. This scaling separates the large responses from the negligible ones. Home-hemodialysis uptake moves nearly a third of its base at the median shock, and the peritoneal-dialysis substitution in the subgroups where it is significant is of the same order (about an eighth of base). The incremental margins are far smaller on the identical scale, a positive but imprecise two percent for fistula and, for adequacy, under two percent of a base already well above clinical targets. Raw coefficients invert this ordering. The fistula coefficient exceeds the home-hemodialysis one, yet its economic magnitude is a fraction, because fistula prevalence begins above fifty percent and home-hemodialysis uptake below two.

The response raises home-hemodialysis use among facilities already equipped for it rather than adding new adopters. Table 6 splits the uptake effect into an extensive margin, whether a facility offers any home hemodialysis, and an intensive margin, the share among facilities that already offered it before the merger. The intensive margin accounts for the response. The home-hemodialysis share rises by 1.1 percentage points among baseline offerers, significant at the five-percent level and about a fifth of that subgroup's base, while the probability that a facility begins to offer the technology moves in the same direction but is imprecisely estimated. Establishing a home-hemodialysis program is a large, discrete

Table 5: Economic Magnitudes of the Competitive Response

	Coefficient (per 1,000 ΔHHI)	(SE)	Base (pre-merger)	% of base (per 1,000)	% of base (median mkt)
Home hemodialysis	0.310**	(0.158)	1.68	+18.4%	+28.7%
Independent facilities	0.303	(0.188)	1.87	+16.2%	+25.2%
Chain facilities	0.327	(0.268)	1.48	+22.1%	+34.3%
Small facilities	0.300	(0.256)	2.95	+10.1%	+15.8%
Large facilities	0.319*	(0.180)	1.16	+27.4%	+42.6%
Peritoneal dialysis	-0.368	(0.333)	9.85	-3.7%	-5.8%
Independent facilities	-0.714**	(0.342)	8.95	-8.0%	-12.4%
Chain facilities	0.372	(0.670)	10.87	+3.4%	+5.3%
Small facilities	-0.833*	(0.460)	11.09	-7.5%	-11.7%
Large facilities	-0.005	(0.462)	9.35	-0.1%	-0.1%
Any home dialysis	-0.058	(0.404)	11.54	-0.5%	-0.8%
In-center hemodialysis	0.081	(0.422)	87.76	+0.1%	+0.1%
Fistula	1.053	(0.665)	51.83	+2.0%	+3.2%
Dialysis adequacy (Kt/V)	-0.028***	(0.002)	1.62	-1.7%	-2.7%

Notes: The coefficient is Post × the merger-predicted change in market HHI (per 1,000 points), from Table 4; home hemodialysis and peritoneal dialysis are shown overall and by ownership (independent/chain) and baseline size (small/large), as in Table 7. *Base* is the outcome's pre-merger mean. Market-clustered standard errors are in parentheses. The two right-hand columns express the coefficient as a percentage of that base, per 1,000 ΔHHI and at the median exposed-market dose (a ΔHHI of 1,555 points). Home-hemodialysis, peritoneal-dialysis, any-home, in-center, and fistula outcomes are patient-share percentages; Kt/V is a unitless dialysis-adequacy index whose movement here is an order of magnitude below the differences the clinical literature treats as meaningful. Stars are from the market-clustered specification: $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

investment that a five-year window is unlikely to capture rivals making from scratch. Scaling a program already in place is the faster margin, and it is where the competitive response concentrates.

Figure 7 traces the dynamics. The pre-merger coefficients are individually and jointly indistinguishable from zero (a joint Wald test returns $p = 0.69$), and the direct test of a pre-existing path, the dose-trend check reported in Section 5.2, confirms that the merger-predicted dose does not predict a facility's pre-merger home-hemodialysis trend. The pre-merger point estimates do drift toward the reference year, but they are imprecise. The leads four and five years out are estimated off the thinnest data and carry by far the widest confidence intervals, so the drift is noise rather than a trend the data can establish. The response is then absent on impact. The coefficients for the merger year and the year after

Table 6: Extensive and Intensive Margins of the Home-Hemodialysis Response

	Combined share	Extensive (offers home HD)	Intensive (share | baseline offerer)
Post × $\widehat{\Delta\text{HHI}}$	0.310**	1.573	1.138**
	(0.158)	(1.419)	(0.461)
State-clustered p	[0.100]	[0.265]	[0.024]
Mean of dependent variable	1.88	18.49	5.72
Observations	54,628	54,628	12,456
Market clusters	806	806	334

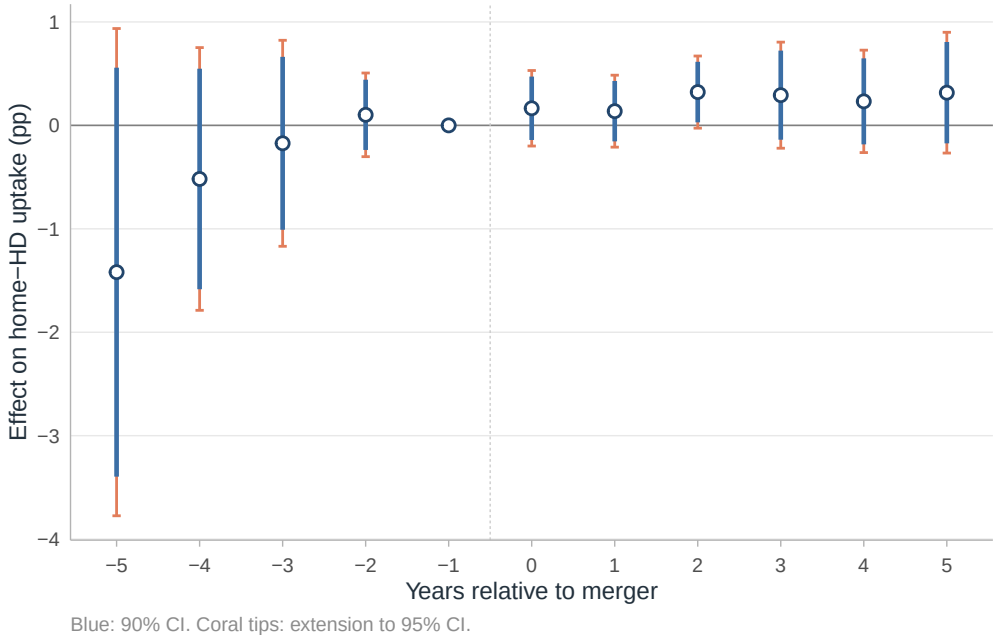
Notes: Each column is a separate stacked difference-in-differences regression on Post × the merger-predicted change in market HHI (per 1,000 points), with facility-by-cohort and year-by-cohort fixed effects. *Combined* is the home-hemodialysis patient share on the full estimation sample (identical to Table 4, column 1). *Extensive* is an indicator, scaled 0–100, for the facility reporting any home-hemodialysis patients, so the coefficient is a percentage-point change in the share of facilities offering the technology. *Intensive* is the home-hemodialysis share estimated on facilities that already offered home hemodialysis in the pre-merger window of their cohort, so the conditioning is pre-treatment. Standard errors clustered on the market (HSA) in parentheses; state-clustered p-values in brackets. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

are small and insignificant, and the effect emerges from the second post-merger year and grows thereafter. The timing is consistent with a technology that is planned and installed over time rather than adopted immediately.

6.2 Who Responds

The home-hemodialysis response is broad, but its composition reflects the mechanism. Table 7 splits the effect by facility type. The home-hemodialysis point estimates are similar across ownership and size (between 0.30 and 0.33 percentage points, statistically indistinguishable from one another), so the response is broad-based across the rival fringe rather than confined to a narrow segment. The *substitution*, by contrast, is concentrated. Peritoneal dialysis falls significantly among independent and small facilities (by 0.7 and 0.8 percentage points per 1,000 Herfindahl points, about eight percent of their peritoneal-dialysis base rates), while it is flat, or slightly rising, for chains and large facilities. The subgroup estimates match the mechanism's prediction, but the sample cannot estimate the contrast between them precisely. The small-versus-large and independent-versus-chain differences

Figure 7: Event-Study Estimates: Home-Hemodialysis Response to Merger-Induced Concentration



Notes: Coefficients on the merger-predicted dose interacted with event-time indicators, relative to the year before the merger, from the stacked design of equation (2). The outcome is home-hemodialysis uptake. Thick blue ranges are 90% and thin coral tips 95% confidence intervals, from market-clustered standard errors. A joint Wald test of the pre-merger coefficients does not reject zero ($F(4, 805) = 0.56$, $p = 0.69$).

carry the expected sign yet are not statistically significant at this window ($p = 0.22$ and $p = 0.14$; Table 7).

The sharper cut is on reallocatable capacity, the mechanism the substitution implies. Splitting the small facilities by their pre-merger peritoneal-dialysis capacity, the decline falls entirely on those with the most to redeploy. Peritoneal-dialysis use drops by 1.9 percentage points where the baseline peritoneal-dialysis share is above the median and does not fall where it is below, a difference significant at $p = 0.035$ (Table 8, Panel B). The same design shows the home-hemodialysis response is larger where the merged firm is more committed to in-center care, so that its installed base makes home hemodialysis the more defensible niche, though this contrast is directional rather than precise (Panel A). Responding rivals do not add home care at the margin so much as trade the easier home modality for the more demanding, more differentiated one, and they do so where they hold the capacity to

Table 7: Heterogeneity by Focal-Facility Type

	Home HD	PD
Panel A. By ownership type (independent / chain)		
Independent	0.303	-0.714**
	(0.188)	(0.342)
Chain	0.327	0.372
	(0.268)	(0.670)
DV mean	2.15 / 1.54	9.80 / 11.90
Facility-years	27,836 / 26,792	27,836 / 26,792
Panel B. By baseline size (small / large)		
Small	0.300	-0.833*
	(0.256)	(0.460)
Large	0.319*	-0.005
	(0.180)	(0.462)
DV mean	3.10 / 1.26	12.76 / 9.91
Facility-years	17,578 / 37,050	17,578 / 37,050

Notes: Each cell is the Post × merger-predicted-dose coefficient for the indicated subgroup, from a single regression that interacts the dose with the subgroup indicator. Market-clustered standard errors in parentheses. *Independent* denotes a facility unaffiliated with any chain at entry into the panel (*chain* otherwise); *small* denotes a baseline patient census below the focal-sample median (*large* otherwise). DV-mean and facility-year rows report each pair's subgroup values over the estimation sample. Difference tests on the peritoneal-dialysis response (full cluster covariance, t with $G-1$ degrees of freedom): small vs. large $p = 0.216$; independent vs. chain $p = 0.137$. For home hemodialysis, the corresponding differences are indistinguishable from zero ($p = 0.949$ and $p = 0.941$). $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

reallocate. The differentiation is in which facilities redeploy peritoneal dialysis to reach home hemodialysis rather than in which facilities adopt it, since most rivals adopt it.

Figure 8 places the aggregate peritoneal-dialysis path beside the home-hemodialysis one. At the market level peritoneal dialysis is flat and statistically indistinguishable from zero throughout, in contrast to the rising home-hemodialysis path of Figure 7. The substitution does not surface in the pooled series precisely because it is confined to the independent and small facilities of Table 7 and is offset by flat or rising peritoneal-dialysis use among chains and large facilities. One modality moves and the other does not, as the mechanism predicts.

6.3 The Geography of the Response

Because dialysis competition is local, the competitive mechanism implies a spatial pattern. A rival's response should be strongest near the merged firm and fade with distance from

Table 8: Defensibility of the Niche: Merged-Firm Commitment and Reallocatable Capacity

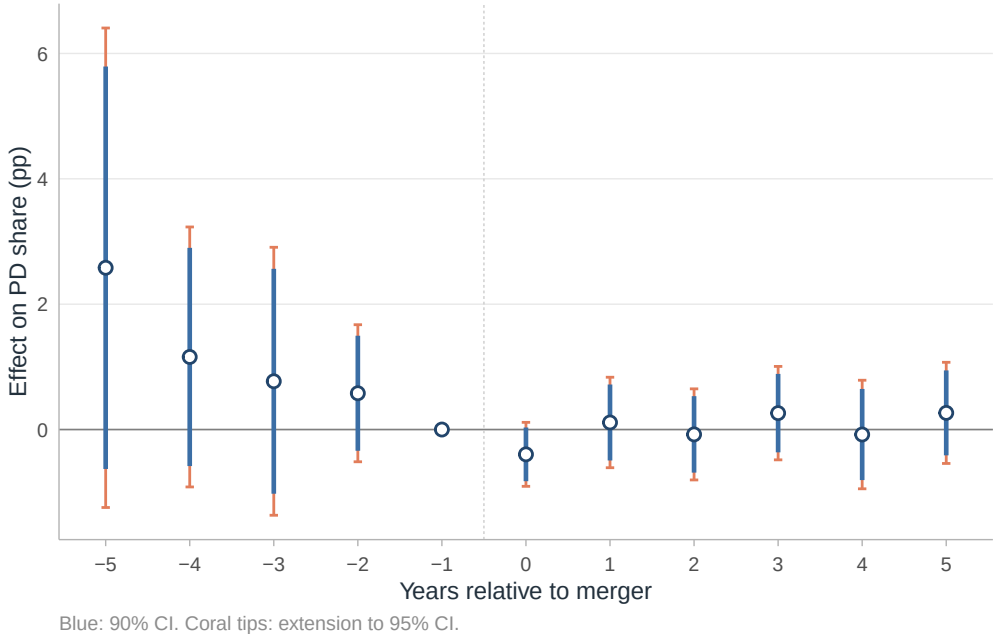
	Post × $\widehat{\Delta\text{HHI}}$
Panel A. Home-HD response by merged-firm in-center commitment (H3)	
More in-center-committed (more defensible)	0.408*
	(0.244)
Less in-center-committed	0.245
	(0.166)
Difference	0.164
	(0.265)
Panel B. PD response of small facilities by baseline PD capacity (H2)	
High baseline PD (more to redeploy)	-1.863**
	(0.877)
Low baseline PD	0.248
	(0.321)
Difference	-2.112**
	(0.999)

Notes: Post × merger-predicted-dose coefficients (per 1,000 ΔHHI) from stacked regressions with facility-by-cohort and year-by-cohort fixed effects, market-clustered standard errors in parentheses. Panel A interacts the dose with an indicator for the merging firm's baseline in-center share exceeding the treated-market median; a more in-center-committed acquirer has a larger installed base to cannibalize, so H3 predicts a larger rival home-HD response in that group. Panel B restricts to small facilities and interacts the dose with an indicator for baseline peritoneal-dialysis share above the median; the capacity clause of H2 predicts a larger (more negative) substitution where more PD capacity is available to redeploy. Difference rows report the between-group contrast (full cluster covariance, t with $G-1$ degrees of freedom): H3 $p = 0.538$, H2 $p = 0.035$. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

it. Figure 9a shows how we measure a rival's exposure, using one market as an example, the Dallas hospital service area. The orange triangle marks a focal rival, a facility that neither merging firm ever owned. The blue markers are the two merging chains' facilities, and the rings lie at five, ten, and twenty miles from the rival. For each focal rival we rebuild the merger's concentration shock from distance-weighted local shares, counting the merging chains' closer facilities more heavily, and we track whether the rival's home-hemodialysis adoption rises with that exposure. We then estimate the response separately for rivals whose nearest merged-firm facility falls within each ring. A response driven by competition with a now-stronger neighbor should be largest for the rivals closest to the merged firm and shrink as that distance grows.

Figure 9b shows this pattern. The home-hemodialysis response is concentrated within five miles of the merged firm, about 0.24 percentage points per 1,000 Herfindahl points, and

Figure 8: Event-Study Estimates: Peritoneal Dialysis (Aggregate)

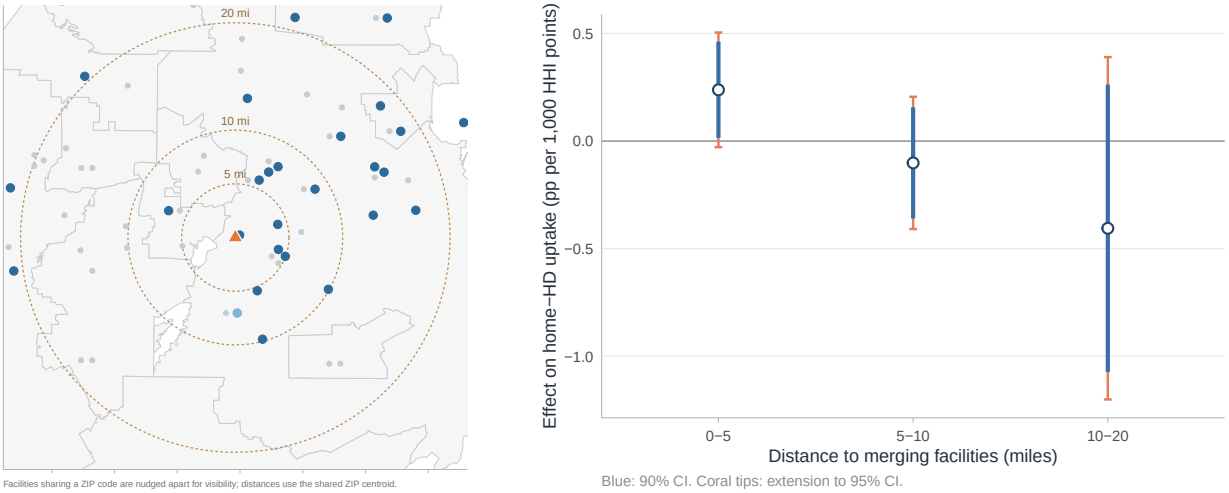


Notes: As in Figure 7, for peritoneal-dialysis uptake. The aggregate path is flat; the concentrated decline among small and independent facilities appears in the heterogeneity split of Table 7, not in this pooled series.

vanishes beyond, with imprecisely estimated point estimates of −0.10 at five to ten miles and −0.41 at ten to twenty. This decline with distance is the most direct test of the mechanism. A market-wide confound, such as a regional taste for home dialysis, a state policy, or a payer shift, would not disappear a few miles from the merged firm, whereas a competitive response to a nearby stronger rival should.

This spatial test also speaks to how mergers are reviewed. Competition in health care is local, so antitrust practice draws geographic markets at the scale of a city or a rural cluster and screens a deal by the concentration it creates there (Gaynor et al., 2015; Elzinga and Hogarty, 1973). The uneven local incidence of a national merger, sharp where the merging chains overlapped and absent elsewhere, is what identifies the response (Dafny, 2009). Because the rivals' adoption is organized by proximity to the merged firm rather than by the market-wide change in concentration, a concentration screen computed at the

Figure 9: The Home-Hemodialysis Response Decays with Distance to the Merged Firm



(a) An exposed market

(b) The distance gradient

Notes: Panel (a) illustrates the distance-based exposure measure in a single market, the Dallas hospital service area, for the Fresenius acquisition of Liberty Dialysis (2012). The orange triangle is a focal rival, a facility that neither merging firm ever owned; the blue markers are the merging firms' facilities, dark for the acquirer and light for the target; grey markers are other providers; and the rings are drawn at five, ten, and twenty miles from the focal rival. Facilities sharing a ZIP code are nudged apart for legibility, and distances are computed between ZIP-code centroids. Panel (b) reports the estimated home-hemodialysis response by the distance band separating the focal facility from the nearest facility of the merged firm, each band estimated against the same clean-control pool. Estimates are in percentage points per 1,000 Herfindahl points, and the vertical ranges are confidence intervals from market-clustered standard errors.

market level can miss it. The distance design recovers that finer geography and locates the response where competition with the merged firm is most direct.

6.4 Identification and Robustness

We return to the threats set out in Section 5.2. The first is that the predetermined shares that generate a large dose proxy for a market's latent home-hemodialysis path. Exposed and control markets differ substantially at baseline (Tables 9 and A.8). The exposed markets are more urban, younger, and, because a large dose is generated by the overlap of two big chains in a contested market, less concentrated to begin with, with normalized differences as large as 1.5. We therefore do not treat the raw sample as balanced. The imbalance, however, runs on dimensions orthogonal to the outcome path. The covariates jointly explain

Table 9: Instrument Balance: The Predicted Dose and Predetermined Market Characteristics

Predetermined covariate	Std. coef. (dose on covariate)	(SE)
Patients	-0.026**	(0.012)
Market HHI	-0.176***	(0.030)
Urban	0.057***	(0.009)
Mean age	-0.119***	(0.028)
Comorbidities	0.015	(0.019)
Baseline home HD	0.020	(0.013)
Joint R^2 (dose on all covariates)	0.074	
Pre-merger home-HD trend on dose	0.337	(0.274)

Notes: Each of the top rows regresses the standardized merger-predicted dose on one standardized predetermined (event-time -1) market covariate, with cohort fixed effects and market-clustered standard errors. Several covariates load significantly, so we do not read the raw sample as balanced; what matters for the design is that the covariates jointly explain little of the dose (the joint R^2, from regressing the dose on all covariates at once) and that the dose is orthogonal to the outcome's baseline level and pre-merger path. The last row regresses each facility's pre-merger home-HD trend on the dose. $^{*}p < .10$,$^{**}p < .05$,$^{***}p < .01$.

little of the variation in the dose ($R^2 = 0.074$), and the dose is uncorrelated with a facility's baseline home-hemodialysis level and its pre-merger home-hemodialysis trend. The key test is whether the response survives once markets that differ on these dimensions are allowed their own adoption paths. Allowing separate year effects for urban status and for terciles of patient age and market concentration leaves the coefficient essentially unchanged, at 0.311 (Table 10). A response manufactured by the exposure shares would attenuate under this control. It does not.

The pre-merger dynamics and two falsification exercises corroborate the reading. The pre-merger event-study coefficients in Figure 7 are individually and jointly indistinguishable from zero, and the dose does not significantly predict a facility's pre-merger home-hemodialysis trend (Table 9). A residual concern, however, is that high-dose markets, being larger and more urban, lie on a faster path of home hemodialysis diffusion. Two exercises address it directly and leave the estimate essentially unchanged (Table 10): the market-characteristic trends above, which absorb market-type-specific time paths, and entropy balancing (Hainmueller, 2012), which reweights clean-control markets to match the exposed markets exactly on baseline size, urbanicity, concentration, patient age, and home-

hemodialysis level, so that treated and control markets share the same baseline covariate means by construction, and with them a comparable diffusion path.

The rival fringe varies in type and size. Independent facilities account for 57 percent of the never-acquired rivals and regional chains for the remaining 43 percent, and home-hemodialysis supply concentrates among the smaller, independent firms (Table A.6). These are the rivals for which the national instrument is cleanest, since their local conduct is unlikely to affect an acquirer's national operations. Re-estimating the dose-response on the independent, the small, and the small-and-independent subsamples leaves the effect intact and, if anything, larger (Panel A of Table A.7), so the response is not an artifact of the regional-chain rivals whose national activity the instrument might not isolate.

A related concern is that the surviving rivals are selected on their technology path: if the national chains avoid acquiring home-hemodialysis adopters, the never-acquired fringe would over-represent home-hemodialysis adopters to begin with. A facility's baseline home-hemodialysis share weakly and negatively predicts later acquisition by a national chain (Panel B of Table A.7), so the survivors are mildly selected toward home dialysis. The within-survivor design differences this level selection out, since treated and control facilities are never acquired, and the dose does not significantly predict a facility's pre-merger home-hemodialysis trend (Table 9). The selection shifts the level of home dialysis in the fringe, not the post-merger change the design identifies.

The concentration shock does not move outcomes that a rival's technology choice cannot plausibly affect. Patient age, comorbidity, and dual-eligibility case-mix are all unresponsive (Table A.1, Panel A), so the estimate is not capturing a general market confound. A fake-merger placebo that re-dates each merger two years early and estimates on strictly pre-merger data returns a coefficient statistically indistinguishable from zero, though the exercise is imprecise (identified off the later cohorts only, with a confidence interval that includes both zero and the main estimate), so we read it as corroborating rather than decisive, and rest the pre-trend case on the flat, jointly insignificant leads and the dose–trend orthogonality

(Panel B). Finally, we rule out a mechanical channel specific to this industry. The Federal Trade Commission conditioned these mergers on divestitures, and a clinic divested into a rival's market could raise measured home capacity absent any behavioral response. Excluding divestiture-recipient facilities, the estimate strengthens rather than weakens, to 0.338, so the response is a genuine change in rivals' conduct and not an artifact of which markets received the divested clinics (Panel C).[9]

A stricter version of this check nets the remedy out of the shock itself. The merger-predicted dose in equation (1) counts the full pre-merger overlap (the concentration the announced merger would have produced), but the Federal Trade Commission divested part of that overlap in the largest deals. Where the exclusion above removes the divested clinics from the sample, this rebuilds the dose from the realized, post-divestiture concentration, dropping the divested clinics from the merging parties' baseline share. Doing so attenuates the pooled coefficient from 0.310 to 0.176, which loses significance at conventional levels ($p = 0.41$; Table 10). Most estimates attenuate, but the pattern is intact in sign. Under the realized shock, home-hemodialysis uptake stays positive across the rival fringe, the peritoneal-dialysis substitution stays negative and concentrated in independent and small facilities, and the response stays largest within five miles of the merged firm (Table A.5). We treat the predicted shock as primary. It is the predetermined merger-simulation object the design is built on, whereas the remedy is an endogenous response the Commission targeted at the highest-overlap markets, and the divested clinics often passed to weak buyers that only partly restored competition (Kwoka, 2015; Ganglmair, 2026). The realized shock is the more conservative reading, and the response survives it in sign, geography, and composition, if not in the precision of the pooled coefficient.

The estimate is stable across the choices that could otherwise drive it. Table 10 collects the robustness battery. The coefficient is significant under clustering on the market and the hospital referral region and marginally significant under the state and the two jointly

[9]Excluding divestiture-recipient facilities, the estimate is significant at the ten-percent level; excluding their entire markets leaves the point estimate larger still but less precise (Table A.1, Panel C).

(p-values of 0.049 to 0.100). Under state-by-cohort clustering the p-value is 0.141, and a permutation test that reassigns the dose across markets within each merger returns a p-value of 0.050. Leaving out each merger in turn (Table A.1, Panel D), each state in turn, and adding region-by-year fixed effects all keep the point estimate positive and of comparable magnitude. Across the drop-one-state re-estimations the coefficient stays positive and significant in almost every case. Because home-hemodialysis uptake is a right-skewed share with a mass of zeros, we also re-estimate it with Poisson and fractional-logit specifications and with the top percentile of the outcome trimmed. The sign is unchanged, the fractional-logit estimate is significant, and trimming the tail leaves the coefficient positive and significant, so the result is not an artifact of the heavy upper tail (Table A.4).

A final concern is specific to the continuous treatment. The stacked design compares each merger only to its own not-yet-treated controls, so the staggered-timing bias of two-way fixed effects does not arise (Goodman-Bacon, 2021; Cengiz et al., 2019), but a dose-response fixed-effects estimator can still weight the underlying treatment effects unevenly across dose levels (Callaway et al., 2024). Table A.3 addresses this directly. The heterogeneity-robust estimator of de Chaisemartin and D'Haultfœuille (2026) for a continuously distributed treatment returns the same sign and a similar dynamic path as the fixed-effects baseline, with a joint placebo test that does not reject parallel trends (Panel A). The negative weights in the fixed-effects estimand sum to essentially zero, and the treatment effects would need a dispersion two orders of magnitude larger than the coefficient for the estimate to carry the opposite sign (Panel B). The heterogeneity-robust estimators of Callaway and Sant'Anna (2021) and Sun and Abraham (2021), which binarize exposure and so target a distinct estimand, agree in sign (Panel C).

Taken together, the estimate is robust to the leading heterogeneity-robust difference-in-differences estimators, to three functional-form choices, to five levels of clustering, to design-based permutation inference, and to the exclusion of spillover-exposed border controls. As emphasized throughout, the evidence is the pattern rather than any single coefficient: a

positive sign, a sharp decline of the response with distance, a differentiation signature concentrated in the firms the mechanism predicts, and stability across estimators, specifications, and inference methods.

6.5 Limitations

Three limitations bound the interpretation. First, identification rests on the exclusion restriction of the shift-share design: that the predetermined shares generating the dose are uncorrelated with a market's latent home-hemodialysis path. We cannot prove this restriction, only assess it, through the balance, pre-trend, market-characteristic-trend, and entropy-balancing checks above; it remains the binding internal-validity assumption.

Second, the effect is identified disproportionately by the large, contested deals. The Renal Care Group, Liberty Dialysis, and Gambro cohorts account for 48, 26, and 23 percent of the identifying variation in the stacked estimator. Dropping the Liberty Dialysis cohort renders the estimate statistically insignificant, and it is only marginally significant without the Renal Care Group cohort (Table A.1, Panel D), so the response is estimated most precisely in the large, urban, contested markets those deals concentrated. Its external validity to smaller acquisitions and rural markets is correspondingly weaker.

Third, home-hemodialysis uptake is a proxy for transformative technology adoption. It is the clearest such margin in these data, but a facility can also respond to a stronger rival on margins these data measure imperfectly or not at all (staffing, capacity, referral relationships), which may move differently.

7 Conclusion

We ask how the rivals of a merging provider change the technology they offer when a merger concentrates their local market. In U.S. dialysis, we find that a merger-induced rise in local concentration raises rivals' adoption of home hemodialysis, a capital-intensive technology,

Table 10: Robustness of the Home-HD Competitive-Response Estimate

Robustness check (outcome: home HD)	Value
Baseline coefficient (HSA-clustered)	0.310
Inference: p-value on the coefficient by clustering	
HSA (market)	0.049
HRR	0.065
State	0.100
Two-way (state + market)	0.100
State × cohort	0.141
Permutation (p; 999 draws)	0.050
Clusters: markets / HRRs / states	806 / 236 / 50
Specification and falsification	
+ Region×year FE (coef; p)	0.290 (0.057)
+ Market-char.×year trends (coef; p)	0.311 (0.064)
Covariate-balanced controls (coef; p)	0.297 (0.132)
Adjacent-market placebo (coef; p)	0.299 (0.062)
Donut: excl. bordering controls (coef; p)	0.320 (0.043)
Net-of-remedy (realized) dose (coef; p)	0.176 (0.405)
Backfill-free baseline (chain_obs) (coef; p)	0.314 (0.046)
Drop-one-state coef range	$[0.205, 0.391]$
Drop-one-state: share $p < .10$	0.96

Notes: Coefficient is Post × merger-predicted ΔHHI (per 1,000) on home-HD uptake, from the stacked design in Table 4. Permutation p reshuffles the market dose within each merger (999 draws). The market-characteristic×year row adds separate year effects for urban status and for terciles of baseline patient age and market HHI, so that markets differing on these dimensions are allowed their own home-HD paths. The covariate-balanced-controls row reweights clean-control markets by entropy balancing (Hainmueller, 2012) to match exposed markets exactly on the means of baseline size, urbanicity, concentration, patient age, and home-HD level. The adjacent-market placebo replaces own-market dose with the mean dose of bordering HSAs; it bounds cross-market spillover, and a positive value indicates spillover to nearby rivals, which biases the main estimate toward zero. The donut row drops the control facilities in HSAs bordering a treated market of the same cohort, so that spillover onto neighboring controls cannot attenuate the estimate. The net-of-remedy row rebuilds the dose from the realized (post-divestiture) rather than the predicted (announced) concentration increase, dropping the FTC-divested clinics from the target's baseline share; the response pattern under this shock is reported in Table A.5. The backfill-free-baseline row recomputes the target's baseline share from the down-only observed chain (chain_obs), which drops facilities whose pre-merger ownership is not directly observed rather than carrying a later ownership label backward into the baseline year; the estimate is unchanged, so the dose is invariant to the ownership-fill convention. Drop-one-state re-estimates leaving out each state.

associated with better survival, that reached fewer than two percent of patients over our study period. The response reaches across the rival fringe, and among small and independent providers it comes by substituting away from the easier home modality toward home hemodialysis, most sharply where a rival holds the capacity to redeploy. It fades beyond five miles of the merged firm. A merger-simulation instrument, built from the merging chains' predetermined local shares, isolates the concentration shock from any rival's own trajectory, and the estimate survives a battery of balance, placebo, and specification checks. Two limits deserve emphasis. The response is identified chiefly by the large contested deals, and it attenuates below conventional significance under the realized, post-divestiture shock.

The finding qualifies the presumption, central to merger review in health care, that consolidation weakens innovation. That presumption is built on the conduct of the merging firms. It does not weigh the response of the rivals that remain. We show that on at least one margin the rival response is the opposite. Competition from a strengthened chain moves the surrounding firms toward a superior technology. The channel is welfare-relevant and, for the markets and technology we study, is contrary to what the standard presumption assumes. It does not overturn that presumption (the adoption we measure is confined to a single transformative technology and a narrow band of geography), but it identifies a competitive-response margin that merger review, focused on the direct harm from lost competition, currently omits.

The mechanism extends beyond dialysis. It requires three conditions: an incumbent whose installed base commits it to the legacy technology, competition that is local, and a differentiating technology the fringe can adopt at facility scale. Many provider markets share this structure (imaging centers facing hospital-system consolidation, independent pharmacies facing chain expansion, physician practices absorbed into systems), as do chain-dominated industries outside health care. Where these conditions are present, the rival margin we document is likely to operate; where the fringe cannot adopt, because capital, licensure, or certificate-of-need rules bind, the standard presumption stands unqualified. Whether the

rival upgrade offsets the harm from consolidation is a question our design makes tractable and that we leave to future work.

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A Additional Robustness

Table A.1 collects the falsification and influence diagnostics discussed in Section 6: the non-responsive case-mix placebos (Panel A), the fake-merger placebo (Panel B), the FTC-divestiture channel (Panel C), and the leave-one-merger-out re-estimation (Panel D). Table A.2 reports the two remaining clinical margins, catheter use and dialysis adequacy. Table A.3 reports the heterogeneity-robust and continuous-treatment estimators, and Table A.4 the robustness to functional form. Table A.5 reports the response pattern under the net-of-remedy (realized) concentration shock.

Table A.1: Falsification and Influence Diagnostics for the Home-HD Response

	Coefficient	(SE)	[p]
Panel A. Non-responsive outcomes (want ≈ 0)			
Mean patient age	0.077	(0.189)	[0.683]
Comorbidity count	0.021	(0.048)	[0.662]
Dual-eligible share	0.549	(0.624)	[0.379]
Panel B. Fake-merger placebo (want ≈ 0)			
Event dated 2 years early	0.728	(0.864)	[0.400]
Panel C. FTC-divestiture channel			
Baseline (all facilities)	0.310**	(0.158)	[0.049]
Excl. divestiture-recipient facilities	0.338*	(0.178)	[0.058]
Excl. divestiture-recipient markets	0.640	(0.424)	[0.132]
Panel D. Leave-one-merger-out			
DaVita–Gambro (2005)	0.369*	(0.200)	[0.066]
Fresenius–RCG (2006)	0.238*	(0.133)	[0.075]
DaVita–NRI (2011)	0.315**	(0.159)	[0.047]
Fresenius–Liberty (2012)	0.230	(0.204)	[0.259]
USRC–Innovative (2013)	0.310**	(0.158)	[0.049]
USRC–DSI (2016)	0.359*	(0.184)	[0.051]

Notes: Each row is the Post × merger-predicted-dose coefficient (per 1,000 ΔHHI) from the stacked design of Table 4, market-clustered standard errors in parentheses and p-values in brackets. Panel A places non-responsive case-mix outcomes on the left-hand side; a rival's technology choice cannot move them, so nonzero coefficients would flag a market confound. Panel B re-dates each merger two years early and estimates on strictly pre-merger data (cohorts with a full pre-window in the home-HD data era). Panel C removes facilities (and their markets) that received FTC-ordered divestitures. Panel D re-estimates leaving out each merger in turn. $^{*}p < .10$,$^{**}p < .05$,$^{***}p < .01$.

Table A.2: Other Clinical Margins: Catheter Use and Dialysis Adequacy

Outcome:	Catheter	Kt/V (adequacy)
Post × $\widehat{\Delta\text{HHI}}$	-0.683	-0.028***
	(0.536)	(0.002)
State-clustered p	[0.176]	[0.000]
Facility×cohort FE	Yes	Yes
Year×cohort FE	Yes	Yes
DV mean	25.66	1.60
Effect, % of DV mean	-2.7%	-1.7%
Observations	55,055	23,973
Market clusters	820	659

Notes: As in Table 4: each column is a separate stacked difference-in-differences regression of the outcome on Post × the merger-predicted change in market HHI (per 1,000 points), with facility-by-cohort and year-by-cohort fixed effects. The catheter share is in percent; Kt/V is a unitless dialysis-adequacy index. Standard errors clustered on the market (HSA) in parentheses; state-clustered p-values in brackets. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.3: Heterogeneity-Robust and Continuous-Treatment Estimators

	Estimate	(SE)
Panel A. Continuous dose-response (per 1,000 ΔHHI)		
Stacked two-way FE (baseline)	0.310**	(0.158)
de Chaisemartin–D'Haultfœuille (2024):		
Instantaneous effect ($e = 1$)	0.087	(0.137)
Effect after five years ($e = 5$)	0.187	(0.305)
Average total effect	0.124	(0.222)
Pre-trend placebo (joint p)	0.52	
Panel B. Two-way FE weighting diagnostic (dCDH 2020)		
Sum of negative weights	-0.001	
Cells with a negative weight	667 / 2,592	
$\sigma(\Delta)$ for a sign reversal	82.8	
Panel C. Binary-exposure ATT (pp; distinct estimand)		
Callaway–Sant'Anna (2021)	0.388	(0.425)
Sun–Abraham (2021)	0.072	(0.196)

Notes: The outcome is home-hemodialysis uptake. Panel A reports the continuous dose-response (effect per 1,000 ΔHHI): the stacked two-way fixed-effects baseline of Table 4 and the heterogeneity-robust estimator of de Chaisemartin and D'Haultfœuille for a continuously distributed treatment, which reports dynamic effects by exposure length and a joint placebo test of parallel trends. Panel B decomposes the TWFE coefficient into its underlying (group×time) ATTs (de Chaisemartin and D'Haultfœuille, 2020): the negative weights sum to essentially zero, and $\sigma(\Delta)$ is the standard deviation of the true ATTs that would be required for the effect to carry the opposite sign. Panel C binarizes exposure (ever a positive dose) and reports the ATT in percentage points, a distinct estimand not directly comparable to the dose-response slope. Market-clustered standard errors. $^{*}p < .10$,$^{**}p < .05$,$^{***}p < .01$.

Table A.4: Robustness to Functional Form

Estimator	Coefficient	(SE)	N
OLS (level, pp)	0.310**	(0.158)	54,628
Poisson / PPML	0.089	(0.069)	22,339
Fractional logit	0.144**	(0.068)	22,339
OLS, trimmed at P99 (≤ 44)	0.259*	(0.145)	54,089

Notes: The outcome is home-hemodialysis uptake, a right-skewed percentage with mass at zero. OLS coefficients are in percentage points; the Poisson/PPML coefficient is a semi-elasticity and the fractional-logit coefficient a log-odds. The implied average marginal effects are +0.40 and +0.42 percentage points, of the same order as the linear estimate. Poisson and fractional logit absorb facility-cohorts with an all-zero outcome into the fixed effects, so they are estimated on the 22,339 facility-cohort-years in facility-cohorts with any positive uptake (mean 4.53 pp). The final row trims the top one percent of the outcome. Market-clustered standard errors. $^{*}p < .10,^{**}p < .05,^{***}p < .01$.

Table A.5: The Response Pattern Under the Net-of-Remedy (Realized) Shock

	Gross (predicted)	Net (realized)
Pooled, home HD	0.310** [0.049]	0.176 [0.405]
Broad home-hemodialysis response (positive across the fringe)		
Independent	0.303 [0.108]	0.194 [0.454]
Small	0.300 [0.242]	0.173 [0.746]
Differentiation signature: peritoneal-dialysis substitution		
Independent	-0.714** [0.037]	-0.465 [0.243]
Small	-0.833* [0.071]	-0.229 [0.747]
Geography: near-field home-HD response		
Within 0–5 miles	0.238* [0.080]	0.109 [0.403]

Notes: Each cell is the Post × merger-predicted-dose coefficient (per 1,000 ΔHHI) with market-clustered p-value in brackets, under the *gross* (predicted, announced-merger) shock used throughout the paper and under the *net* (realized) shock, which drops the FTC-divested clinics from the merging parties' baseline share. The subgroup rows interact the dose with the indicated focal-facility type, as in Table 7; the 0–5-mile row is from the distance design of Figure 9. Netting attenuates the pooled estimate and most subgroup estimates but leaves the sign and shape of the pattern intact: home-hemodialysis uptake stays positive across the fringe, the peritoneal-dialysis substitution stays concentrated in independent and small facilities, and the response stays largest within five miles. $^{*}p < .10,^{**}p < .05,^{***}p < .01$.

Table A.6: Composition of the Rival Fringe and Home-Dialysis Supply

		Share	Modality (% of patients)		
Rival group	Facilities	(%)	Home HD	Peritoneal	In-center
Independent	1,356	57	5.6	9.7	84.1
Regional chain	1,032	43	2.1	13.2	84.3
Small	1,190	50	9.1	13.7	76.7
Large	1,198	50	2.0	10.6	86.9
All rivals	2,388	100	3.9	11.4	84.2

Notes: Never-acquired focal facilities (the rival fringe), classified by firm type and by baseline patient census (small vs. large at the focal-sample median). Modality shares are patient-weighted over facility-years. The two national acquirers, DaVita and Fresenius Medical Care, are excluded by construction. Small and independent rivals supply the most home hemodialysis and are the firms for which the national merger instrument is most plausibly exogenous.

Table A.7: Instrument Exogeneity and Selection into Acquisition

	Estimate	Facilities
Panel A. Home-HD dose-response by exogenous subsample		
Full sample	0.310**	2,130
	(0.158)	
Independents only	0.380*	1,199
	(0.200)	
Small facilities only	0.387	985
	(0.292)	
Small and independent	0.546	569
	(0.391)	
Panel B. Predicting acquisition by a national chain (LPM)		
Baseline home-HD share (pp)	-0.0056***	
	(0.0010)	
Baseline size, urbanicity, concentration	Yes	
Facilities	3,247	

Notes: Panel A re-estimates the market-level home-hemodialysis dose-response (Post $\times$ $\widehat{\Delta\text{HHI}}$ per 1,000 index points, stacked design with facility-by-cohort and year-by-cohort fixed effects, market-clustered standard errors) on the subsamples for which the national instrument is most plausibly exogenous: independent facilities, small facilities, and their intersection. The point estimate is stable, if larger, across them, so it is not driven by the regional-chain rivals whose national conduct the instrument might not isolate; precision falls with the subsample size. Panel B presents a linear probability model of whether a not-yet-national-chain facility is later acquired by DaVita or Fresenius, controlling for baseline home hemodialysis share (percentage points), patient census, urbanicity, and local market concentration. The coefficient is small and negative (-0.0056, SE 0.0010): a one-standard-deviation increase in the baseline home-hemodialysis share lowers the acquisition probability by about 3.6 percentage points, against a 44.6-percent base rate, so surviving rivals are mildly selected toward home dialysis. This level selection is differenced out by the within-survivor design, in which treated and control facilities are never acquired, and Table 9 shows that the dose does not significantly predict a facility's pre-merger home hemodialysis trend, so the selection does not generate the estimated response. $^{*}p < 0.10$,$^{**}p < 0.05$,$^{***}p < 0.01$.

B Data Appendix

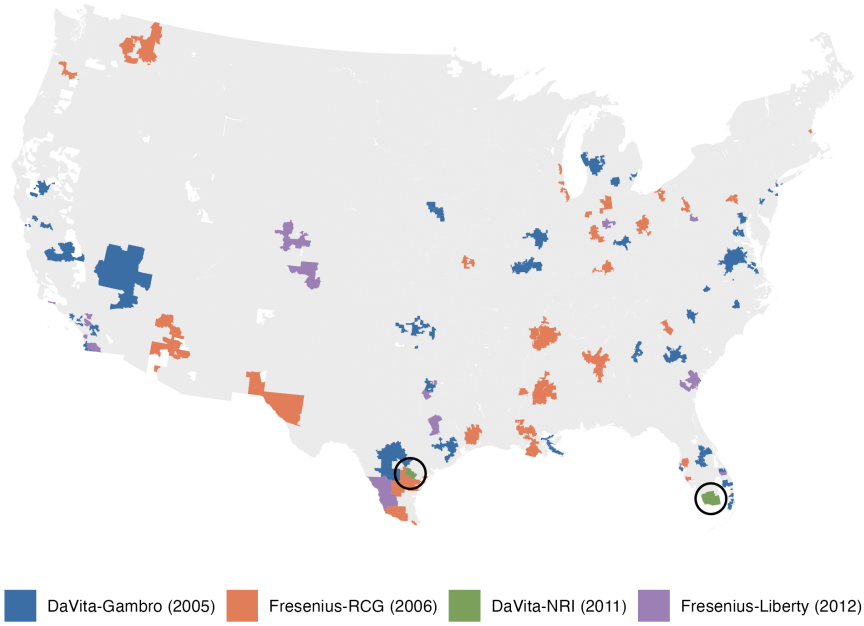
Table A.8 compares focal facilities in exposed and not-yet-exposed markets on predetermined characteristics. Figures A.1 and A.2 map the treated markets and the predicted concentration shock generated by the largest deal.

Table A.8: Baseline Balance: Exposed vs. Not-Yet-Exposed Markets

Baseline variable	Exposed	Control	Norm. diff.
Patients	97.37	97.98	-0.007
Market HHI	2,895	5,944	-1.466
Urban	0.99	0.90	0.431
Home HD (%)	2.90	1.58	0.131
Mean age	54.40	61.74	-0.620
Comorbidities	4.64	4.93	-0.274

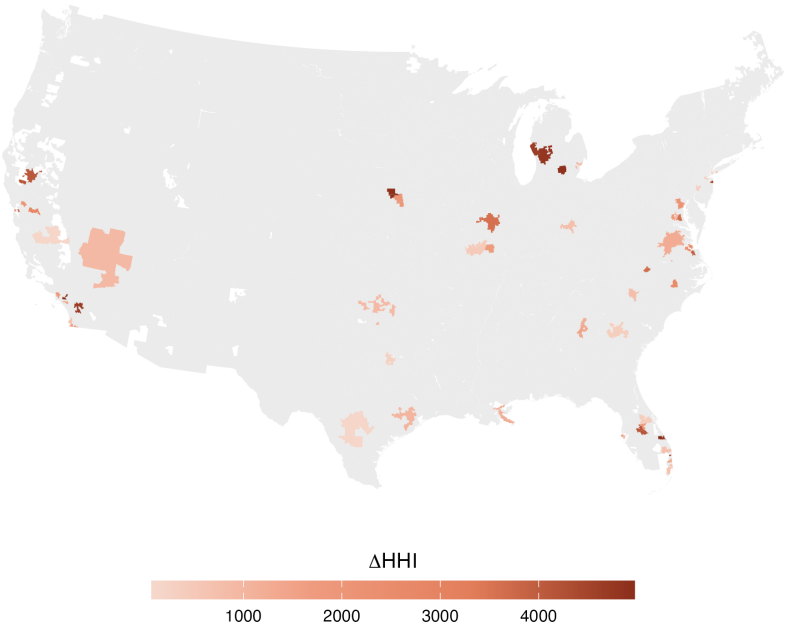
Notes: Means in the year before treatment (event time -1) for focal facilities in exposed vs. not-yet-treated markets. Normalized difference $= (\bar{x}_E - \bar{x}_C)/\sqrt{(s_E^2 + s_C^2)/2}$; $|\cdot| < 0.25$ indicates good balance.

Figure A.1: Treated Markets



Notes: Hospital service areas exposed to a chain merger (positive merger-predicted dose), colored by the merger that first exposed each; continental United States. Markets exposed by more than one merger are attributed to the first, so the 2011 and 2016 deals color only two markets (ringed) and none, respectively. Their overlapping markets were already exposed by earlier deals.

Figure A.2: Predicted Concentration Shock from the Gambro Acquisition



Notes: Merger-predicted concentration shock from DaVita's 2005 acquisition of Gambro Healthcare, by hospital service area.