Witness to a Merger*

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Abstract

Antitrust analysis usually focuses on changes in local market structure; we show that identity—both of the acquirer and of its ostensible competitors—may matter more. We study acquisitions of independent dialysis facilities by the two national chains that dominate the industry. Patient outcomes decline at an acquired facility if no independent facility remains; in particular, the yearly death hazard rate increases by 10 to 14%. Harm is no smaller when the other national chain is present than when the acquirer becomes a local monopolist, even though, in the former case, the local market structure need not change. By contrast, when an independent facility remains, patient outcomes do not deteriorate. These results suggest that the high degree of multimarket contact between the two dominant firms may play a key role in suppressing competition.

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1 Introduction

Competition is often viewed as the primary safeguard against quality deterioration following healthcare consolidation. Yet evidence on whether competition actually disciplines healthcare providers remains surprisingly mixed (Gaynor and Town, 2011; Gaynor, Ho, and Town, 2015). Competition is not just a count of firms but a test of incentives—incentives to improve quality, to innovate, and to attract patients away from rival firms. When dominant rivals encounter one another across many markets repeatedly, duopoly can preserve the appearance of competition while draining away the dynamic that makes competition matter.

In healthcare markets, in which prices are often set by government mandate, antitrust regulators often treats "nearby competitors" as a key safeguard against declining quality (Competition and Markets Authority, 2014, paras. 6.46–6.54). But, given the mixed evidence in the literature, it is not clear whether competition can truly discipline the behavior of profit-maximizing providers in administered-price markets such as health care. We ask whether the same large providers behave differently when they are local monopolists than when they face local competition. Moreover, how to usefully define competition is unclear: the mere presence of another provider on a map does not guarantee competitive pressure. When the same firms face each other across many local markets, competition can lose its disciplining bite. A facility that fights aggressively for patients in one locale may invite retaliation elsewhere. A costly investment in quality improvement in one market may start a race neither firm wants to run nationally. Multimarket contact can therefore convert local rivalry into mutual forbearance (Edwards, 1955; Feinberg, 1984; Bernheim and Whinston, 1990): collusion without a handshake, softened competition without a "smoking gun." This possibility matters especially in healthcare, where the relevant margin is often not a posted price but staffing, treatment intensity/quality, referral effort, care integration, and the quiet work of helping patients navigate complex care. We ask whether local competition protects healthcare quality when the remaining competitor is not an independent rival, but the same

national chain the firm faces across hundreds of other markets. When a healthcare market has the same two firms across many markets, does it actually have competition?

In this paper, we study these questions for the U.S. dialysis market, in which the stakes of "soft" competition are measured in survival. More than 500,000 Americans with end stage renal disease (ESRD) rely on dialysis treatment, roughly 130,000 new patients develop ESRD each year, and such a patient has a life expectancy only a quarter that of a same-aged American: a woman beginning dialysis in her late sixties can expect to live less than five years, compared to nearly nineteen for her contemporaries (United States Renal Data System, 2025). Treatment is grueling and local: patients typically travel to a dialysis center three times per week for four-hour sessions. A nearby clinic is not a mere convenience. It is the infrastructure through which patients receive life-sustaining care, avoid hospitalization, and, for some, reach the kidney transplant waitlist. Dialysis also offers a particularly interesting institutional environment because provision is dominated by two national chains, DaVita and Fresenius—the "Big 2"—which together account for more than 70 percent of facilities. Big 2 acquisitions reduce quality in general (Eliason, Heebsh, McDevitt, and Roberts, 2020; Wollmann, 2026). Yet the role of competition remains surprisingly unclear. Some Big 2 acquisitions appear highly harmful, while others appear to have little effect. Such ambiguity points to the need for more economic nuance. We argue that standard local-market definitions of competition combine fundamentally different environments. And, once we separate these environments, a clear empirical pattern emerges: Big 2 acquisitions of local monopolists are harmful; Big 2 acquisitions that leave only DaVita and Fresenius facing each other are also harmful; but Big 2 acquisitions in markets that retain independent competitors do no significant harm.

A central contribution of the paper is thus to recover the role of competition in understanding the effects of healthcare consolidation. We look beyond whether another clinic is present and ask who owns/controls that clinic. An independent (non-Big 2) facility may face reputational, referral, hospital-affiliation, or community-based incentives that sustain

quality even in concentrated markets. A national chain such as one of the Big 2 that acquires that monopolist faces a different calculus regarding the costs and benefits of providing high quality care. But a second clinic does not automatically restore "discipline." If the second clinic is owned by a fellow Big 2 chain, the incentives to provide quality at the acquired facility are determined by the full relationship between the Big 2 firms. They might not need an explicit agreement to understand that aggressive quality competition in one market can change behavior in many markets. Meanwhile, independent competitors may have different incentives as they do not interact with the acquirer in other markets. The empirical question is therefore not whether local market structure sustains competition. It is whether the remaining competitor provides meaningful discipline.

Empirically, we study acquisitions of independent dialysis facilities by DaVita and Fresenius and ask how it affects patient outcomes. We classify post-acquisition county markets into three groups: monopoly markets, Big 2 duopoly markets, and competitive markets with at least one remaining independent facility. In our analysis, we document 744 Big 2 acquisitions of interest, including 236 that create Big 2 monopolies and 78 that create Big 2 duopolies. This classification lets us separate two margins that standard local-market analysis can conflate: First, what happens when a Big 2 chain acquires the only local dialysis provider? Second, what happens when a market still has two providers, but the only rivalry is between DaVita and Fresenius? The first margin tests whether competition disciplines Big 2 ownership. The second tests whether Big 2 duopoly constitutes "genuine competition" or merely the appearance of competition.

Our empirical exercise uses patient- and facility-level data from the United States Renal Data System (USRDS), including Medicare claims. We study independent dialysis facilities acquired by DaVita or Fresenius. We compare post-acquisition changes within the same facilities around the time of acquisition and ask if those changes vary across monopoly, Big 2 duopoly, and competitive markets, controlling for patient characteristics, facility fixed effects, and year fixed effects, with standard errors clustered at the facility level. Our design does

not rest on a cross-sectional comparison of "good" and "bad" markets. Rather, it asks how outcomes change at the same facility after acquisition, and whether those changes differ systematically depending on whether the acquired facility faces no rival, the other Big 2 chain, or an independent competitor. We look at one- and two-year survival rates as well as the yearly death hazard rate, with other patient outcomes and facility practices providing supporting evidence. Rich patient characteristics allow us to adjust for changes in patient mix.

We find that acquisitions by a Big 2 chain are followed by sharply different mortality outcomes depending on who remains in the market. In monopoly and Big 2 duopoly markets, the yearly death hazard rises by 10–14 percent, while one- and two-year survival falls by roughly 2–5 percentage points. By contrast, when a rival outside the Big 2 remains, we detect no decline in either survival measure, and the death hazard rate estimate is negative. The Big 2 duopoly estimates are more adverse in point terms than the monopoly estimates, although we cannot reject equality between them. The mortality changes in both market types differ significantly from those in competitive markets.

Other measures of care reinforce this pattern. In monopoly and Big 2 duopoly markets, the probability of hospitalization in a given month increases by roughly 3–4 percentage points, a large change against a pooled mean of 6.9 percent. The declines in the probability of reaching the transplant waitlist and in full-time nurses per patient are roughly twice and nearly three times as large, respectively, as in competitive markets. Thus, the pattern is not confined to mortality: patients are hospitalized more often and have less access to transplantation, while acquired facilities staff fewer nurses per patient. Taken together, these findings suggest that post-acquisition deterioration is most pronounced where no rival outside the Big 2 remains. A Big 2 duopoly does not sit halfway between monopoly and competition. It behaves like a monopoly with two logos.

The literature on multimarket contact shows that repeated interaction across markets can soften rivalry (Evans and Kessides, 1994; Busse, 2000; Schmitt, 2018; Hatfield and Wallen,

2022; Lin and McCarthy, 2023). And recent work on dialysis, including that by Eliason et al. (2020) and Wollmann (2026), showed that Big 2 acquisitions reduce quality, although the degree to which this depends on the competitive environment remains debated. We connect these conversations and show that the relevant competitive object is not the number of firms alone. It is also the identity and strategic position of the remaining rival. While existing work shows that acquisitions by the Big 2 reduce quality, we show that the role of competition becomes much clearer once competition is measured correctly. Local measures treat independent rivals and Big 2 rivals as equivalent competitors. We show that they are not. Independent competition substantially mitigates the harms of Big 2 ownership, whereas Big 2 duopoly does not. Multimarket contact is therefore not merely an additional mechanism; it plays a central role in determining whether a facility is subject to competitive pressure.

The paper is organized as follows: Section 2 provides contextual background on the dialysis industry. Section 3 describes the data and the population of interest. We present our results on the effects of Big 2 acquisitions in Section 4. Section 5 concludes.

2 Background on the Dialysis Industry and the Big 2

2.1 End-Stage Renal Disease and Dialysis

Kidneys remove waste products and excess fluid from the blood, regulate blood pressure, and help stimulate red blood cell production. When kidney disease progresses to end-stage renal disease (ESRD), most patients in the United States begin to receive in-center hemodialysis. This requires going to the facility multiple times a week for several hours at a time to have a dialysis machine circulate blood through an external filter to remove waste products and excess fluid. Although kidney transplantation is the gold-standard treatment for ESRD, new ESRD cases exceed the number of annual transplants performed, and in-center hemodialysis remains a life-saving therapy for more than 400,000 individuals in the US

(United States Renal Data System, 2025).

The Social Security Amendments of 1972 provide diagnosis-based Medicare eligibility for ESRD, extending the traditional age-based qualification to pay for dialysis and kidney transplants. As a result, traditional Medicare fee-for-service (FFS) was a primary payer for the majority of patients requiring in-center hemodialysis in the time period that we study.[1] Because ESRD requires frequent visits to dialysis clinics, these beneficiaries account for a disproportionately large share of Medicare expenditures—over $55 billion per year—despite comprising a small share of the Medicare population (United States Renal Data System, 2025).

Dialysis facilities provide dialysis-related care and referrals. This includes erythropoiesis-stimulating agent (ESA) injections to manage anemia and routine lab work. Most of the routine care is provided by facility-employed nurses and technicians. They also provide referrals to a surgeon for vascular access creation that provides more reliable access to blood vessels. Dialysis facilities also play an important role in referring patients to transplant centers for joining the waitlist (Patzer et al., 2015).

Since 2011, Medicare FFS has paid facilities under a prospective payment system (PPS) that uses a bundled payment to cover staff time along with ESRD-related drugs, lab services, and equipment. Because PPS pays for a per-treatment bundle, it can incentivize cost-reduction through reduced staffing or ancillary services. Before 2011, Medicare reimbursed separately for difference services such as ESA injections creating incentives to administer these drugs. The PPS has eliminated these incentives, potentially at the expense of patient health outcomes.

To mitigate cost-reduction incentives created by the PPS, Medicare also implemented a Quality Incentive Program (QIP) that took effect in 2012 to reduce payments to facilities that fail to meet specific quality measures. These criteria include measures directly under facility control like anemia-related outcomes to incentivize appropriate ESA injections. It

[1] Our time period is before the rapid growth in Medicare Advantage (MA) as a primary payer.

also includes vascular access measures that might indirectly improve referrals to vascular surgeons.

2.2 The Dialysis Industry and the Big 2

Widespread coverage of ESRD has coincided with large growth in the number of dialysis facilities in the US. From 1997 to 2021, the number of facilities more than doubled from just over 3,000 to nearly 8,000. By 2021, most counties had at least one facility, and some urban counties had more than 100 (Figure 1). The market has also become more concentrated over time and is now dominated by the "Big 2" companies: DaVita and Fresenius. In 1997, they owned less than one-third of facilities; but by 2021 the Big 2 owned over 70% of dialysis facilities in the country (Figure 2).

DaVita and Fresenius grew through acquisitions of independent dialysis clinics and smaller dialysis chains along with entry into new markets (Xia et al., 2025). The large amount of entry over time has resulted in geographic markets (measured at the county level) becoming less concentrated with most markets having an HHI between 3,500 and 6,500 in 2021 compared to more than a quarter of markets being monopolies in 1997 (Figure 3). The overlap in county-level markets where the Big Two both have a facility has grown alongside the decline in monopolistic markets (Figure 4). This creates substantial multimarket contact between the Big 2, including many counties where they are the only two dialysis facility owners.

The FTC has used merger reviews to address consolidation in the dialysis industry, mostly for large acquisitions by the Big 2 of other dialysis chains. However, much of the FTC's focus has been on local geographic markets rather than addressing multimarket contact. For example, in 2005, DaVita acquired Gambro Healthcare Inc., the third-largest outpatient dialysis provider at the time. This was allowed under the requirement that DaVita divest facilities in certain local markets where the acquisition was determined to result in an unacceptable level of concentration (Federal Trade Commission, 2005). These divestitures created a new independent dialysis chain, named Renal Advantage. In 2010,

Renal Advantage merged with another chain to form Liberty Dialysis Holdings, which became the new third-largest dialysis provider (Renal Advantage, 2010). In 2012, Fresenius acquired Liberty Dialysis Holdings. The FTC again approved this acquisition subject to specific local-market divestitures.

FTC analyses for the 2005 and 2012 approvals explicitly state that "competition among dialysis clinics occurs at a local level," and frame competitive harm through local-market effects rather than nationwide consolidation (Federal Trade Commission, 2005, 2012). Recent FTC commissioner statements acknowledge potential anticompetitive effects of a nationwide duopoly but do not identify the potential compounding role played by multimarket contact (Chopra, 2019). As the Big 2 have grown to be the dominant owners in many overlapping markets, the potential for multimarket contact to soften competition has grown.

Concerns that DaVita and Fresenius may behave as overly friendly competitors have been illustrated by recent litigation and policy disputes. Recently, the benefits fund of a labor union filed a class action lawsuit against DaVita and Fresenius alleging a conspiracy to fix prices, divide geographic markets, and reduce quality (UFCW Local 1776 Fund v. DaVita Inc., 2025). Among other things, it alleges that the Big 2 made public donations to the American Kidney Fund (AKF) to steer patients away from Medicare/Medicaid towards higher-paying private insurers. These concerns also motivated a California law to limit the Big 2's ability to profit from higher reimbursements induced by their donations to the AKF. Due to a suit brought by DaVita, Fresenius, and the AKF, this law had major provisions invalidated allowing the Big 2 to benefit from their charitable donations (United States Court of Appeals for the Ninth Circuit, 2026). These joint efforts of the Big 2 illustrate the need to consider nationwide consolidation and multimarket contact rather than focusing solely on the local nature of dialysis markets.

3 Data and Descriptive Statistics

3.1 Data Sources

Our data come primarily from the USRDS, a data clearinghouse funded by the National Institute of Diabetes and Digestive and Kidney Diseases. They track Medicare administrative files, Medicare claims, annual facility surveys, and clinical surveillance data, which we combine into patient and facility-level panels. As nearly all ESRD patients become eligible for Medicare regardless of age, the USRDS provides essentially universal coverage of U.S patients on dialysis. We supplement the USRDS data with two external sources: CMS Provider of Service (POS) files, which record street addresses and change-of-ownership (CHOW) dates, and the HUD ZIP-to-county crosswalk, which we use to assign facilities to markets.[2]

We observe incoming patient data with the Medical Evidence form (CMS-2728), which providers must submit to Medicare at each patient's onset of ESRD and which CMS uses to establish Medicare eligibility. From this form we observe a patient's demographics (sex, race, ethnicity, age at incidence), insurance coverage, and various comorbidities recorded at the start of treatment. The USRDS keeps track of each patient's complete treatment history, which records of every dialysis performance from incidence through transplant or death. The ESRD Death Notification form (CMS-2746) provides mortality information, including the date and causes of death. Kidney transplant and waitlisting events, including listing dates, are populated from the Organ Procurement and Transplantation Network records included in the USRDS. In addition to these administrative files, we use Medicare institutional claims. Inpatient claims allow us to observe the admission date of each hospitalization and any associated diagnoses.

Facility-level data come from the CMS Annual Facility Survey, a form which every Medicare-certified dialysis facility must submit to maintain certification. From these surveys

[2]The construction of facility and patient panels, along with the definitions and dating of facility acquisitions, are similar to that of Eliason et al. (2020) and Wollmann (2026).

we observe each facility's identifiers, address, chain affiliation, ownership type, staffing, and number of dialysis stations. We merge the facility data with the (POS) files, and finally, we assign facilities to counties using the Department of Housing and Urban Development's ZIP-to-county crosswalk.

We perform two steps to identify acquisitions. First, we use the Annual Facility Survey to find facilities whose reported chain affiliation changes: an independent-to-chain acquisition is a facility that reports no chain affiliation in one year and a chain affiliation the next. Because a facility's Medicare identifier frequently changes when it is acquired, we first harmonize facility identifiers over time by matching facilities at the same street address, treating records that which report the same address as the same facility. Second, we date each acquisition using a hierarchy of CMS sources, preferring the POS change-of-ownership date, then the POS certification date, then the certification date reported in the facility survey.

We combine these data sets into two main analysis samples. The first is a facility-year panel covering 9,926 facilities from 1996 through 2021, with each facility's chain affiliation, staffing, capacity, and local market structure. We measure market structure at the county level: for each county-year we count the number of facilities operated by DaVita, by Fresenius, by other chains, and by independents.

The second is a panel of new (incident) dialysis patients. For each patient we observe the facility where they began care, their demographics and comorbidities at incidence, and outcomes over fixed horizons from their first dialysis date: survival at one and two years, placement on the kidney transplant waitlist or receipt of a transplant, and hospitalization. To link each patient's outcomes to a single treating facility, we restrict this panel to patients who remain at their original facility for their entire observed treatment history, and we drop patients who begin care within 180 days of their facility's acquisition, when the timing of the ownership change is ambiguous. For within-patient analyses we also construct a patient-month panel from 2002 onward that records, for each month a patient is on dialysis, whether they were hospitalized and the dialysis-related claims they generated.

Patients at facilities acquired by DaVita or Fresenius are classified by the market structure of their county at the moment of acquisition: acquisitions that give one of the two chains all of the county's facilities under a single owner (monopoly), acquisitions that leave the county with only DaVita and Fresenius facilities (duopoly), and acquisitions in counties where at least one independent facility remains (competitive).

3.2 Descriptive Statistics

Our primary estimation sample is a panel of incident dialysis patients ranging from 1996 through 2021. Table 1 summarizes acquisition activity, facility employment, and patient composition. We identify 9,926 facilities across 170,121 facility-years. Of the 1,217 acquisitions of independent dialysis facilities with valid acquisition dates, roughly 60 percent were made by the two national chains, DaVita (493) and Fresenius (251). Central to our analysis, a substantial share of these Big 2 deals eliminated all remaining competition in the local market: 236 left a single chain owning every facility in the county (a Big 2 monopoly) and another 78 left DaVita and Fresenius as the only owners in the county (a Big 2 duopoly).

The average facility treats 73 patients (median 63) with approximately four full-time nurses and five full-time patient-care technicians, with little part-time labor. Dialysis markets are generally thin: summarized at the county-year level, the median county has exactly one dialysis facility, the 75th percentile has three, and the mean is 3.4. With markets this concentrated, a single acquisition of an independent facility often shifts a county to monopoly, which motivates our focus on market structure at the moment of acquisition.

The typical patient starts dialysis at age 66; 44 percent are female, 15 percent are Hispanic, and 27 percent are Black. 63 percent of new patients survive their first year on dialysis, and half die within the first two years.

4 Facility Acquisitions and Competition

4.1 Empirical Framework

Our baseline analysis compares new patient outcomes at facilities acquired by DaVita or Fresenius; we compare outcomes at such facilities before and after the acquisition, and determine whether the change in outcomes depends on the local competitive environment. For patient i beginning dialysis at facility f in year t, we estimate:

$$y_{ift} \;=\; \sum_{m \in \{\text{Mon, Duo, Comp}\}} \beta_m \Big(D_f^m \times \text{Post}_{ft} \Big) \;+\; \alpha_f \;+\; \delta_t \;+\; \gamma X_i \;+\; \varepsilon_{ift}, \tag{1}$$

where $D_f^m \in \{0, 1\}$ is a post-acquisition market structure indicator variable, Post_{if} is a post-acquisition indicator, α_f is a facility fixed effect, δ_t is a year fixed effect, and X_i are observed patient characteristics. We consider three mutually exclusive market structures: Big 2 monopoly (Mon), Big 2 duopoly (Duo), or competitive (Comp). We exclude patients who begin care within 180 days before or after the acquisition and patients whose facility changes market structure more than once. The vector X_i contains patient characteristics recorded at dialysis initiation: sex, race, Hispanic ethnicity, age-at-incidence category, and baseline comorbidities (tobacco use, cancer, hypertension, and peripheral vascular disease).

Facility fixed effects α_f restrict identification to within-facility comparisons of earlier versus later patient cohorts, cohort-year fixed effects δ_t absorb time-series trends in dialysis outcomes, and patients at never-acquired facilities help pin time and patient-level characteristic effects. Standard errors are clustered at the facility level. Because the three treatment cells are mutually exclusive, each $\hat{\beta}_m$ is the post-acquisition change in outcomes at acquired facilities in environment m; beneath each table we also report the pairwise differences $\hat{\beta}_{\text{Mon}} - \hat{\beta}_{\text{Comp}}$, $\hat{\beta}_{\text{Duo}} - \hat{\beta}_{\text{Comp}}$, and $\hat{\beta}_{\text{Mon}} - \hat{\beta}_{\text{Duo}}$, which are the market-structure contrasts at the center of the paper.

For hospitalization we exploit the monthly panel and strengthen the design to within-

patient comparisons. Unlike single-event outcomes such as death or kidney transplant, analyzing hospitalizations allows us to observe outcomes for the same patient's health both before and after the acquisition. For patient i in calendar month τ,

$$h_{i\tau} \;=\; \sum_{m} \beta_m \, \text{PostAcq}_{i\tau}^{m} \;+\; \mu_i \;+\; \delta_\tau \;+\; \varepsilon_{i\tau}, \tag{2}$$

where $h_{i\tau}$ equals 1 if patient i has any inpatient admission in month τ and 0 otherwise. $\text{PostAcq}_{i\tau}^{m}$ equals 1 when patient i is treated at a cohort-m acquired facility and month τ falls on or after the acquisition month, and 0 otherwise. Patient fixed effects μ_i absorb every time-invariant patient characteristic (including the facility fixed effects), so β_m is identified from changes in a given patient's hospitalization rate as their own facility passes through an acquisition, relative to the month effects δ_τ identified by patients at never-acquired facilities.

Facility-level analyses (staffing, transfer rates) replace the patient dimension with a facility-year panel and estimate the analogous specification with facility and year fixed effects. Thus for outcome s_{ft} we estimate

$$s_{ft} \;=\; \sum_{m} \beta_m \, \text{Post}_{ft} \;+\; \alpha_f \;+\; \delta_t \;+\; \varepsilon_{ft},$$

allowing us to compare within facility changes post-acquisition by market type.

4.2 The Effects of Big 2 Acquisitions on Patient Outcomes

Table 2 presents the results of estimating equation (1) for survival: survival rates fall sharply after an acquisition creates a Big 2 monopoly or duopoly, but do not fall after an acquisition by one of the Big 2 that does not do so. After a facility's acquisition creates a Big 2 monopoly in that market, the one-year survival rate of patients at that facility falls by 2.01 percentage points, while the two-year survival rate falls by 2.82 percentage points. Similarly, after an acquisition by one of the Big 2 creates a Big 2 duopoly market, the one-year and two-year survival rates at the acquired facility fall by 4.67 and 4.82 percentage points, respectively.

Meanwhile, at acquired facilities in markets that remain competitive, patients beginning care after a Big 2 acquisition fare no worse than the patients who preceded them: the post-acquisition change in one-year survival is +0.63 percentage points and in two-year survival is +0.40 percentage points, although both of these estimates are statistically indistinguishable from zero.

The changes in the hazard rate given in the third column of Table 2 allows us to understand the economic significance of these estimates: An acquisition creating a Big 2 monopoly costs a patient roughly one tenth of their remaining life, while one creating a Big 2 duopoly roughly one-eighth, compared to an average life expectancy of approximately two and a half years in our sample.

Comparing across market structures makes our results even more stark: The post-acquisition change in two-year survival rates at acquired facilities is 3.22 percentage points more negative in a market that became a Big 2 monopoly than in a market that remained competitive; and the post-acquisition change in two-year survival rates at acquired facilities is 5.22 percentage points more negative in a market that became a Big 2 duopoly than in a market that remained competitive. Measuring by survival rates, a market where the only remaining rival is the other member of the Big 2 is statistically indistinguishable from a market with no rival at all.[3]

To help understand what is driving these results, we decompose the two-year mortality effect by primary cause of death in Table 3. Each column estimates an indicator for dying within two years due to its stated cause. Sepsis—a life-threatening dysregulated immunological response to infection—is the cause of death most directly tied to facility hygiene, catheter care, and staffing. Death rate by sepsis at a facility rises by 0.77 percentage points after an

[3]One concern may be that markets which become monopolies and duopolies are fundamentally different from those which maintain a competitive environment. Counties with many facilities and large populations are more likely to maintain a competitive environment with at least one independently owned facility. In Table A1 we address these concerns by including in our regressions an additional interaction term: the number of facilities at the time of acquisition with the post-acquisition dummy variable. We find coefficient on this term to be small and mostly insignificant, while the coefficients on our variables of interest are largely unchanged.

acquisition creates a Big 2 monopoly and 1.52 percentage points after an acquisition creates a Big 2 duopoly. Meanwhile, after a Big 2 acquisition in a market that remains competitive, the two-year sepsis death rate *falls* by .49 percentage points. Comparing across market structures, the post-acquisition change in the two-year sepsis death rate at acquired facilities is 1.26 percentage points higher at facilities in a market that became a Big 2 monopoly than in a market that remains competitive; the post-acquisition change in the two-year sepsis death rate at acquired facilities is 2.01 percentage points higher at facilities in a market that became a Big 2 duopoly than in a market that remained competitive. The death rate from dialysis withdrawal also increases, by 0.87 percentage points, at an acquired facility after that acquisition creates a Big 2 monopoly; but the effect is statistically indistinguishable from zero for other acquisitions. Cardiac mortality and deaths coded as from unknown or other causes show no differential response. Our decomposition results thus localize the excess mortality in a cause that facility administration can affect: Preventing sepsis requires preventing infection, which in turn relies on staffing—which is precisely where we find the largest operational changes after acquisition (cf. Section 4.3).

We next examine whether patients join the transplant waitlist. Dialysis facilities are effectively gatekeepers for that list: patients may self-refer, but few have the information to do so and so in practice transplant centers play a key role in referring patients (Patzer et al., 2015; OPTN/UNOS Minority Affairs Committee, 2015). Facilities also have a financial interest in a patient continuing to generate dialysis revenue; this tension has led both journalists and researchers to identify for-profit dialysis-chain ownership as a significant impediment to patients' access to the transplant waitlist (Zhang et al., 2014; Mueller, 2023). Table 4 shows that waitlisting falls after Big 2 acquisitions in *every* environment, but it falls significantly more if the market becomes a Big 2 monopoly. Waitlisting after 2 years falls by 2.62 percentage points at a facility after an acquisition creates a Big 2 monopoly and by 2.61 percentage points at a facility after an acquisition creates a Big 2 duopoly. Meanwhile, waitlisting after 2 years falls by only 1.31 percentage points at a facility whose market remains competitive

after that facility's acquisition. These effects are large relative to the sample mean of 8.11%, implying relative declines of 32% for Big 2 monopolies and duopolies and 16% for competitive markets. The difference in waitlisting outcomes between Big 2 acquisitions that create Big 2 monopoly markets and those in competitive markets is 1.31 percentage points and is statistically significant. Thus, while independent competition does not fully insulate patients from Big 2's lower propensity to waitlist, it does cut the loss roughly in half.

Our results so far compare patients who began treatment before acquisition to those who began treatment after acquisition. A natural concern is that these sets of patients are different; however, as Figure 5 shows, these sets of patients look essentially the same on the rich set of observables from the Medical Evidence form, which records a detailed clinical assessment from the onset of ESRD. Hospitalization allows us to go further and estimate within-patient effects, as hospitalization can recur for the same patient. Table 5 accordingly reports estimates from equation (2) on how different types of Big 2 acquisitions affect hospitalization rates: Monthly hospitalization rates at a facility increase by 2.96 percentage points after its acquisition creates a Big 2 monopoly, and by 3.86 percentage points after its acquisition creates a Big 2 duopoly. These estimates are large compared to the baseline hospitalization rate of 6.88 percent, representing 43% and 56% increases. That translates to approximately one additional hospitalization every three years of treatment under monopoly, and every two years under duopoly, *for every patient*. Meanwhile, at facilities acquired by the Big 2 in markets that remain competitive, hospitalization rates still rise by 1.23 percentage points (an 18% relative increase) but this estimate is statistically indistinguishable from zero. Comparing across market structures, we find that the post-acquisition increase in hospitalization rates is 2.62 percentage points higher in markets that became duopolies and 1.73 percentage points higher in markets that became monopolies relative to markets that remained competitive, although this latter estimate is only significant at the 10% level.

4.3 The Effects of Big 2 Acquisitions on Facility Operations

Our previous results have shown that patient outcomes—as measured by death hazard and hospitalization rates—worsen after an acquisition that creates a Big 2 monopoly or duopoly. But facility administrators do not choose outcomes directly; rather, they make choices about how care is provided that induce those outcomes. Staffing accounts for roughly half of a typical facility's operating costs (Centers for Medicare and Medicaid Services, 2014); highly-skilled nursing staff are particularly expensive, earning nearly twice as much as technicians (U.S. Bureau of Labor Statistics, 2025). Thus, if administrators at such newly acquired facilities skimp on quality in order to lower costs, we should see those facilities reduce staffing levels or substitute away from more expensive staffing.

Table 6 shows that, after a facility's acquisition creates a Big 2 monopoly, the number of nurses per 100 patients falls by 1.48, relative to a sample mean of 7.08; after a facility's acquisition creates a Big 2 duopoly, the number of full-time nurses per 100 patients falls by 1.39. Meanwhile, the number of full-time nurses per 100 patients falls by only 0.54 after acquisition of a facility whose market remains competitive. In the typical units the industry uses, our estimates imply that a full-time nurse's caseload increases from roughly 14 to 18 patients after an acquisition that creates a Big 2 monopoly or duopoly, compared to roughly 15 patients when an independent competitor remains. The difference in changes in staffing levels by type of acquisition is highly significant: the difference between facilities in *ex post* monopoly markets and *ex post* competitive markets is 0.94, while it is 0.85 between facilities in *ex post* Big 2 duopoly markets and *ex post* competitive markets. At the same time, the number of technicians per 100 patients *rose* by 0.69 at facilities in *ex post* monopoly markets relative to facilities in *ex post* competitive markets, suggesting that acquired facilities in *ex post* monopoly markets substitute away from more expensive nurses to less expensive technicians. The estimate of the difference in technician staffing levels between *ex post* Big 2 duopoly markets and *ex post* competitive markets points in the same direction, although it is

not statistically significant. Nurses and technicians are not interchangeable, and the tasks that separate them—e.g., caring for a vascular access site and recognizing infection—are the ones most likely to be associated with outcomes such as sepsis. Indeed, Grieco and McDevitt (2017) estimated that a dialysis facility can increase its patient load by 1.6 percent by allowing its expected rate of septic infection to rise by one percentage point; the facilities at which we find the largest changes in staffing levels are the same facilities in which we also find the largest increases in mortality due to sepsis (Table 3).

4.4 Determinants of Facility Acquisition

We model the acquisition of independent facilities as a discrete-time hazard using the equation

$$\Pr\Big(\text{Acq}_{ft} = 1\Big) = \Lambda\Big(\beta_{\text{Mon/Duo}}\,\text{Mon/DuoPot}_{ft} + \gamma' X_{ft} + \delta_t\Big), \tag{3}$$

where Acq_{ft} equals one if DaVita or Fresenius acquires facility f in year t, and Mon/DuoPot_{ft} is equal to one if acquiring that facility would lead to either a monopoly or a duopoly for the Big 2. We estimate (3) via logit, where $\Lambda(\cdot)$ denotes the logistic function.

Our earlier results imply that an independent facility is worth more to one of the Big 2 if its acquisition would leave the county without an independent rival: such facilities stint on nursing (Table 6) and may lower operational costs in other ways, leading to worse patient outcomes (Section 4.2). If the Big 2 anticipate that such facilities will have lower costs for them and not lose patients, then they should preferentially acquire such facilities.

Table 7 shows that they do. Counties with a single independent facility are .85 percentage points more likely to be acquired, a 40% increase over the baseline acquisition rate. Counties in which one of the Big 2 is already present along with one independent operator are even more likely to see an acquisition by the Big 2: a 1.82 percentage point increase in the likelihood of being acquired, i.e., a 85% increase over the baseline acquisition rate. And counties in which both of the Big 2 are present but still have one independent operator are yet even

more likely to see an acquisition of that operator by one of the Big 2: a 3.05 percentage point increase in the likelihood of being acquired, which translates to a 143% increase over the baseline acquisition rate. Thus, our estimates describe an acquisition strategy by the Big 2 under which the facilities most likely to be acquired are exactly those facilities for which an acquisition will lower quality the most.

5 Conclusion

Our results show that competition disciplines provider behavior. But ascertaining the competitiveness of a given market is challenging: to do so requires not just examining market shares but understanding the relationships between the providers in that market. In the market for dialysis, our results show that the Big 2 do not treat each other as true competitors; an acquisition that creates a Big 2 duopoly is no less harmful than one that creates a Big 2 monopoly, with both lowering the quality of provision as measured in terms of patient health and survival. Meanwhile, Big 2 acquisitions do not seem to degrade quality when the acquired facility is still subject to competition from independent operators. This difference matters more than it otherwise would because the Big 2 target precisely those facilities whose purchase leaves a market without an independent rival.

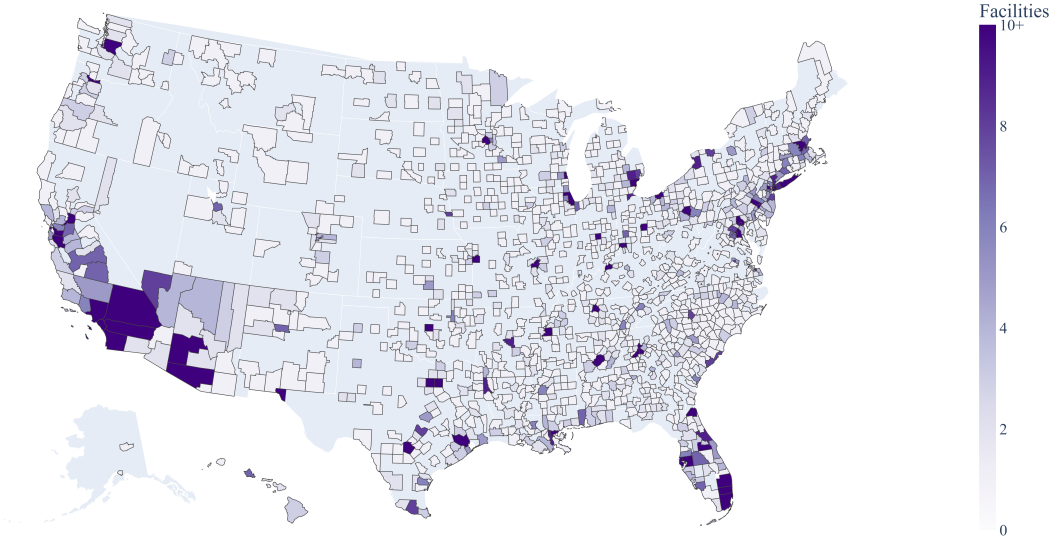
This paper changes how competition in health care should be measured and regulated. In healthcare—as in many other markets—mergers between firms with non-overlapping markets have generally been treated as not harming competition (King et al., 2023). And yet firms that meet in many different markets have both stronger incentives and more tools to forestall competition. In our setting, the Big 2 have grown steadily to account for over 70% of facilities; this growth has allowed them to extend their relationship, further discouraging competition between them, competition that is vital in incentivizing life-sustaining care. For policymakers, our work implies that a more nuanced view of competition is necessary: An acquisition that leaves local market structure unchanged can still vitiate incentives for quality, and whether it

does depends on whether an independent rival remains.

Figure 1: **Facilities by County**

This figure gives the number of facilities in each county in the USA. Panel A presents the facilities in 1997, while Panel B presents the facilities in 2021. Note that this figure caps the number of facilities at 10, although some of the more populous counties can have over 100 such as Los Angeles County in California.

Panel A: 1997



Panel B: 2021

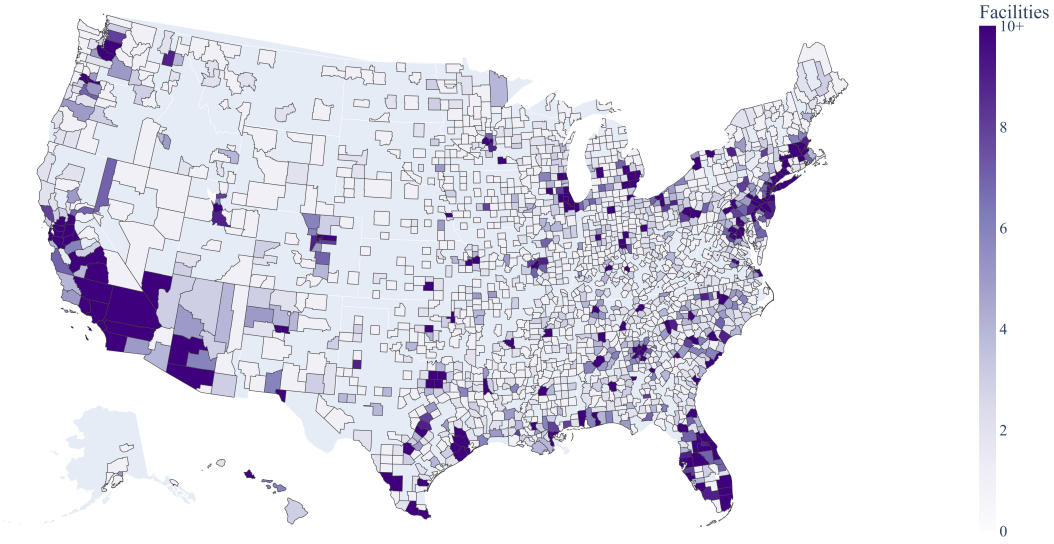


Figure 2: **Facilities By Chain Affiliation**

This figure presents the number of facilities by ownership each year. We classify facilities not owned by Davita or Fresenius but still owned by a chain which is recognized by the USRDS as “Other Chain".

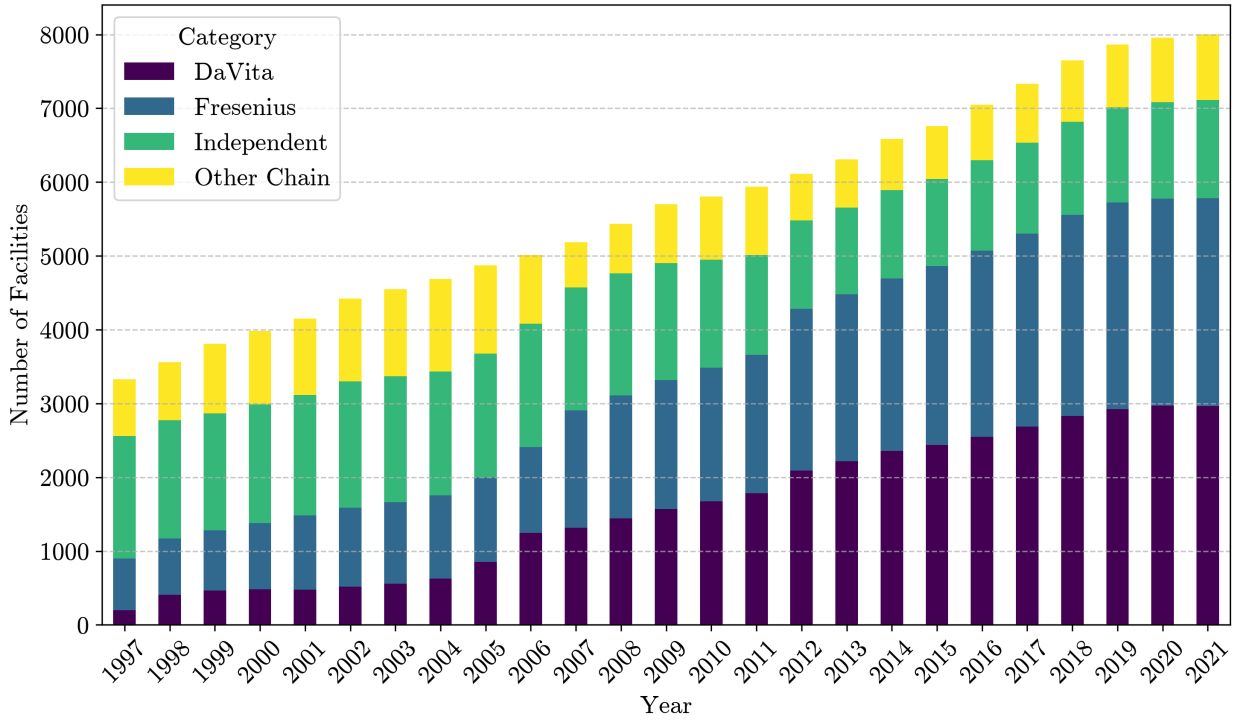


Figure 3: **HHI over time**

This figure gives County Level HHI/10,000 overtime. The patient weighted mean as well as the facility level 25th and 75th percentile are shown.

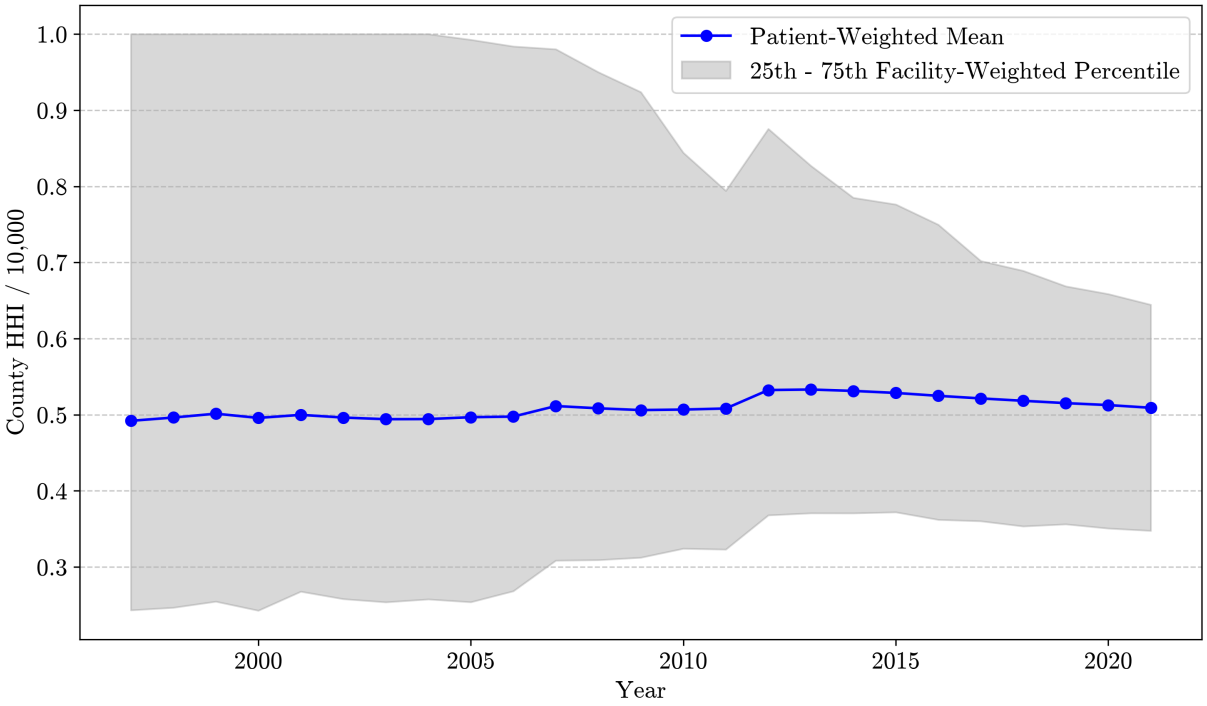


Figure 4: **Multimarket Contact by Chain Affiliation**

This figure gives the fraction of Davita and Fresenius facilities which share a county over time

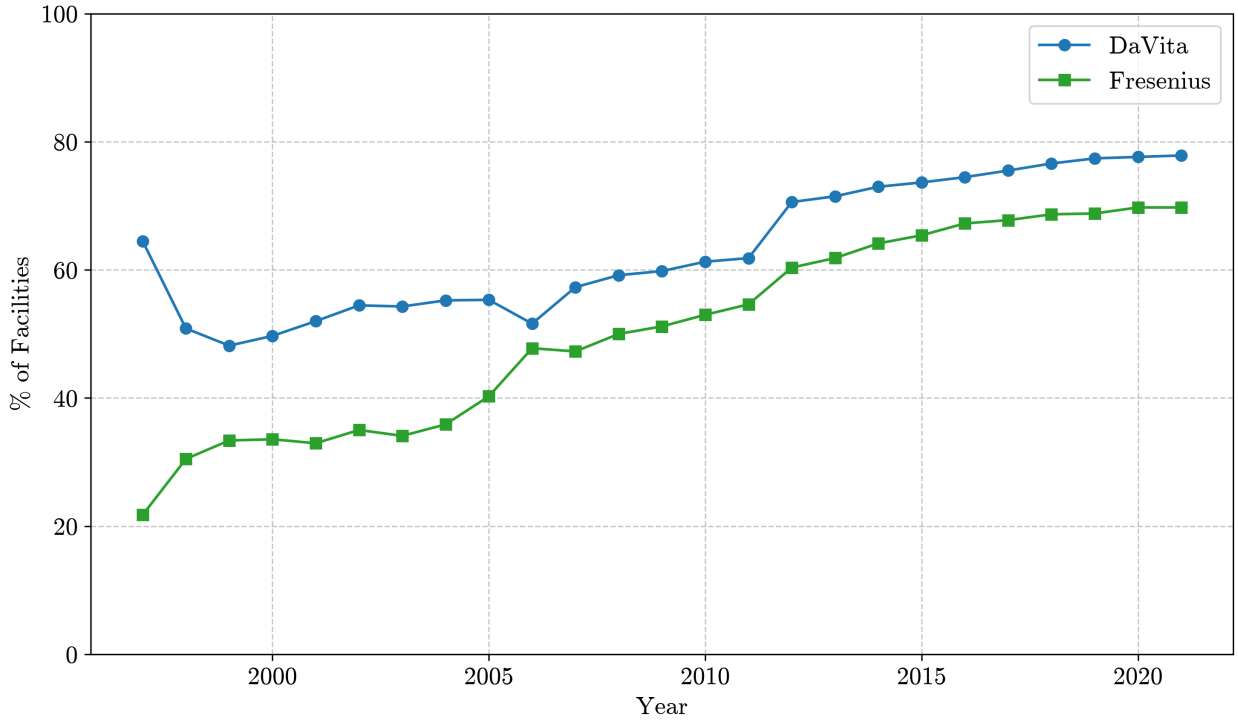
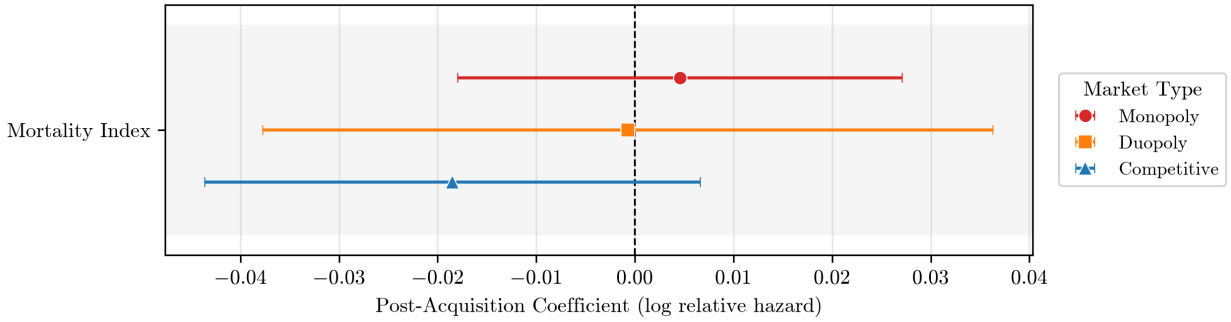


Figure 5: **Forest Plot: Incoming-Patient Comorbidity Post Big 2 Acquisition**

This figure presents post-acquisition coefficient estimates with 95% confidence intervals from new-patient regressions with their mortality index (Cox linear predictor) and each comorbidity as the outcome. The sample and specification parallel the new-patient outcome regressions: facility and cohort-year fixed effects, demographic controls, and facility-clustered standard errors. The three colored series correspond to the three post-acquisition county market structures (monopoly, duopoly, competitive).



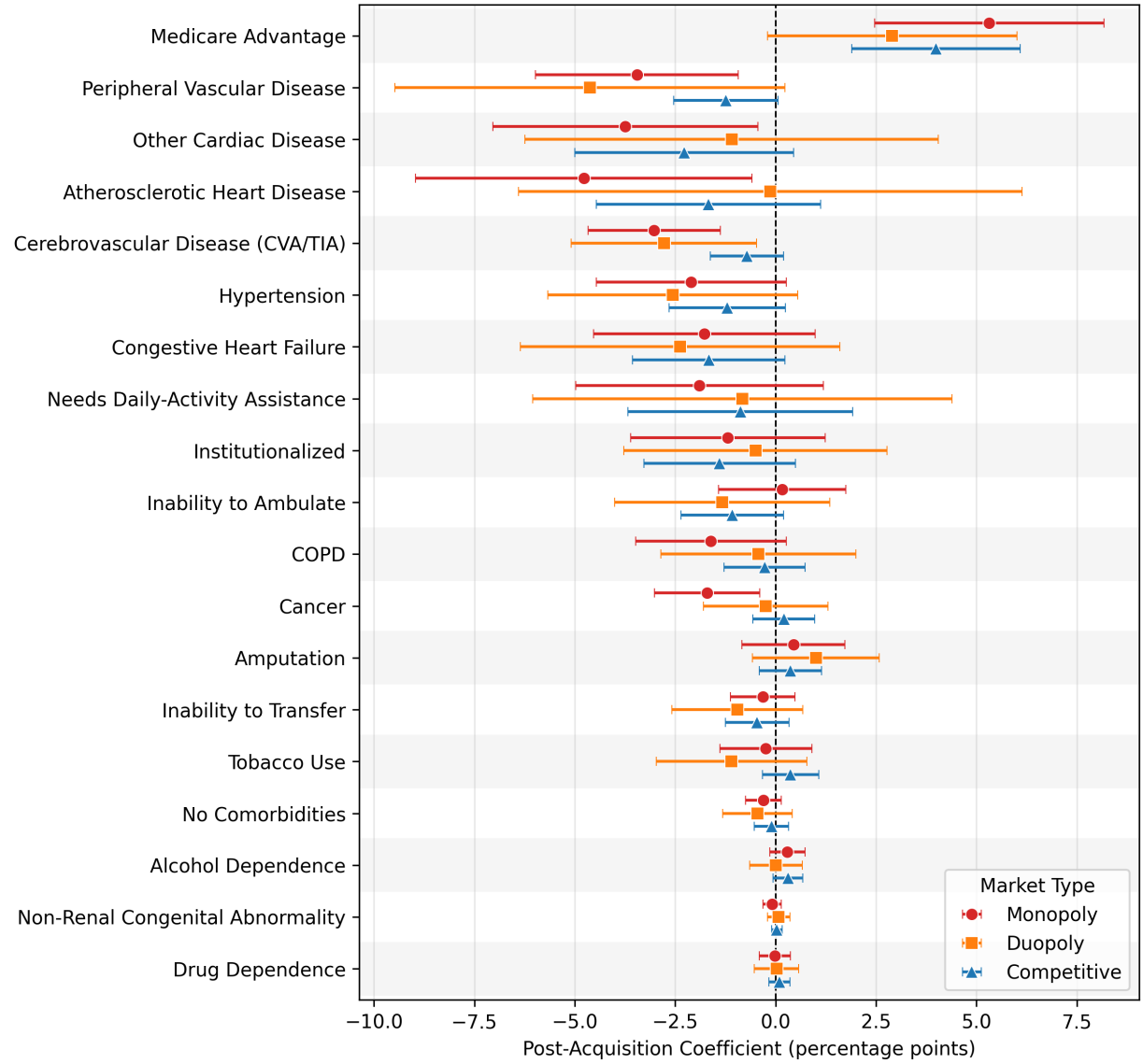


Table 1: **Summary Statistics**

This table presents summary statistics at the patient and facility level. We analyze the outcomes for 948,589 unique patients who only attend a single facility. We identify 9,926 facilities across 170,121 facility-years. Of the total DaVita and Fresenius acquisitions, 59 resulted in a market shared by one of the Big 2 and a different chain, but with no independent facilities.

Acquisitions by Type

Total Acquisitions	DaVita Acquisitions	Fresenius Acquisitions	Big-2 Monopoly Acquisitions	Big-2 Duopoly Acquisitions
1,217	493	251	236	78

Facility Statistics

	Mean	25%	50%	75%
Patient census	73.32	38.00	63.00	97.00
FT nurses (RN + LPN)	4.05	1.00	3.00	6.00
PT nurses (RN + LPN)	0.74	0.00	0.00	1.00
FT technicians	4.79	1.00	4.00	7.00
PT technicians	0.64	0.00	0.00	1.00
Facilities per county	3.39	1.00	1.00	3.00

New Patient Statistics

	Total Mean	Mean (1996)	Mean (2021)
Age at initiation (yrs)	66.0	65.9	63.3
Female	44.3%	48.5%	41.9%
Hispanic	15.4%	10.3%	19.2%
Race: White	65.9%	64.7%	61.8%
Race: Black / African American	27.4%	29.3%	28.5%
Race: Native American	0.9%	0.9%	1.1%
Race: Asian	3.7%	2.6%	5.2%
Race: Pacific Islander	1.0%	0.8%	1.3%
Race: Multiracial	0.7%	1.6%	0.6%
Race: Unknown / Other	0.3%	0.3%	1.5%
1-year survival	63.2%	53.7%	82.6%
2-year survival	50.0%	36.1%	79.1%
1-year waitlist	7.26%	3.61%	9.30%
2-year waitlist	8.51%	4.54%	9.38%
Observations	948,589	21,617	87,402

Table 2: **Big 2 Acquisition Effects on Survival**

This table presents coefficients for regressions at the new patient level. For the first two columns, the dependent variables are indicators for patient survival at 365 and 730 days following dialysis initiation. The third column reports the percentage change in the yearly Poisson death hazard rate. Acquisitions here are only flagged if the acquiring firm was one of the Big 2. "Monopoly" indicates that post-acquisition, a single Big 2 firm owned all dialysis facilities. "Duopoly" indicates that post-acquisition, there is at least one of each of the Big 2 firms and combined, they own all of the facilities in the county. "Competitive" indicates there is at least one independent facility at the time of acquisition. All regressions include patient level controls and time and facility fixed effects. Standard errors are clustered at the facility level.

	Survival		
	Survives 365 Days (% pt.)	Survives 730 Days (% pt.)	Yearly Death Hazard (% chg.)
Monopoly × Post-Acq.	-2.01**	-2.82***	10.32***
	(0.97)	(1.06)	(2.16)
Duopoly × Post-Acq.	-4.67***	-4.82***	14.14***
	(1.52)	(1.61)	(3.16)
Competitive × Post-Acq.	0.63	0.40	-2.93*
	(0.73)	(0.80)	(1.61)
Sample Mean	61.33	45.58	25.88
Observations	831,749	774,573	2,734,982
Adj R-squared	0.045	0.053	–
Monopoly - Competitive	-2.64**	-3.22**	13.65***
	(1.19)	(1.31)	(2.85)
Duopoly - Competitive	-5.30***	-5.22***	17.58***
	(1.67)	(1.78)	(3.74)
Monopoly - Duopoly	2.66	2.00	-3.34
	(1.79)	(1.91)	(3.24)
Controls	X	X	X
Facility FE's	X	X	X
Year FE's	X	X	X

Facility-Level Clustered standard errors in parentheses

Table 3: **Big 2 Acquisition Effects on Cause of Death**

This table presents coefficients for regressions at the new patient level, mirroring Table 2. The dependent variables are dummy variables, equal to 1 to the patient died within 2 years of beginning dialysis of the stated cause, and 0 otherwise. All regressions include patient level controls and time and facility fixed effects. Standard errors are clustered at the facility level.

	Two-Year Cause-Specific Mortality (%)				
	Sepsis	Withdrawal	Cardiac	Unknown/Other	All Other Codes
Monopoly × Post-Acq.	0.77**	0.87**	-0.39	2.94***	-1.46*
	(0.34)	(0.42)	(1.04)	(0.92)	(0.82)
Duopoly × Post-Acq.	1.52**	0.59	-2.14	3.40**	1.13
	(0.60)	(0.88)	(2.29)	(1.71)	(1.57)
Competitive × Post-Acq.	-0.49*	0.03	-1.55*	3.10***	-1.39**
	(0.27)	(0.34)	(0.84)	(0.94)	(0.70)
Sample Mean	3.57	2.95	22.04	11.12	14.75
Observations	786,289	786,289	786,289	786,289	786,289
Adj R-squared	0.001	0.008	0.009	0.003	0.004
Monopoly - Competitive	1.26***	0.84	1.16	-0.16	-0.07
	(0.43)	(0.53)	(1.32)	(1.30)	(1.06)
Duopoly - Competitive	2.01***	0.55	-0.59	0.29	2.51
	(0.66)	(0.94)	(2.43)	(1.95)	(1.71)
Monopoly - Duopoly	-0.75	0.28	1.75	-0.45	-2.58
	(0.69)	(0.98)	(2.51)	(1.93)	(1.76)
Controls	X	X	X	X	X
Facility FE's	X	X	X	X	X
Year FE's	X	X	X	X	X

Facility-Level Clustered standard errors in parentheses

Table 4: **Big 2 Acquisition Effects on Transplant Waitlist**

This table presents coefficients for regressions at the new patient level, mirroring Table 2. The dependent variable measures whether the patient was placed on the kidney transplant waitlist. All regressions include patient level controls and time and facility fixed effects. Standard errors are clustered at the facility level.

	On Transplant Waitlist (% pt.)	
	365 Days	730 Days
Monopoly × Post-Acq.	-2.54***	-2.62***
	(0.32)	(0.36)
Duopoly × Post-Acq.	-2.23***	-2.61***
	(0.45)	(0.53)
Competitive × Post-Acq.	-1.18**	-1.31**
	(0.55)	(0.51)
Sample Mean	7.08	8.11
Observations	831,749	774,573
Adj R-squared	0.020	0.031
Monopoly - Competitive	-1.36**	-1.31**
	(0.57)	(0.55)
Duopoly - Competitive	-1.06	-1.31*
	(0.65)	(0.68)
Monopoly - Duopoly	-0.31	-0.00
	(0.46)	(0.56)
Controls	X	X
Facility FE's	X	X
Year FE's	X	X

Facility-Level Clustered standard errors in parentheses

Table 5: **Big 2 Acquisition Effects on Hospitalization**

This table presents coefficients for regressions at the patient-month level. In the first column, the dependent variable is a monthly dummy variable equal to 1 of the patient was hospitalized for any reason during that month, and 0 otherwise. The second column samples the first 24 months of each incoming patient, and assigns that patient-month a 1 if they are both alive and not hospitalized, and a 0 otherwise. Market and acquisition structure follow Table 2. Standard errors are clustered at the facility level.

	Hospitalization	
	Hospitalized (% pt.)	Alive and Hosp.-Free (Months, First 24)
Monopoly × Post-Acq.	2.963***	-0.715***
	(0.385)	(0.219)
Duopoly × Post-Acq.	3.856***	-0.723**
	(0.573)	(0.326)
Competitive × Post-Acq.	1.234	-0.014
	(0.812)	(0.175)
Sample Mean	6.879	14.23
Observations	25,343,588	622,074
Adj R-squared	0.000	0.066
Monopoly - Competitive	1.728*	-0.701**
	(0.897)	(0.277)
Duopoly - Competitive	2.622***	-0.709*
	(0.992)	(0.367)
Monopoly - Duopoly	-0.893	0.008
	(0.672)	(0.390)
Patient FE's	X	
Facility FE's		X
Controls		X
Month FE's	X	
Year FE's		X

Facility-level clustered standard errors in parentheses

Table 6: **Facility Nurses and Technicians per Patient**

This table presents coefficients for regressions at the facility level. The dependent variables capture the ratio of nursing and technician staff to patients. All regressions include time and facility fixed effects. Standard errors are clustered at the facility level.

	Nurses and Technicians per Patient (%)			
	FT Nurse/Patient	PT Nurse/Patient	FT Technician/Patient	PT Technician/Patient
Monopoly × Post-Acq.	-1.48***	-0.42***	0.37	-0.06
	(0.25)	(0.14)	(0.25)	(0.12)
Duopoly × Post-Acq.	-1.39***	-0.29	0.02	-0.23
	(0.37)	(0.22)	(0.49)	(0.17)
Competitive × Post-Acq.	-0.54***	-0.46***	-0.32*	-0.38***
	(0.15)	(0.12)	(0.18)	(0.10)
Sample Mean	7.082	1.241	7.899	0.994
Observations	99,572	99,572	99,572	99,572
Adj R-squared	0.003	0.001	0.000	0.001
Monopoly - Competitive	-0.94***	0.04	0.69**	0.32**
	(0.29)	(0.18)	(0.31)	(0.16)
Duopoly - Competitive	-0.85**	0.18	0.34	0.16
	(0.40)	(0.25)	(0.52)	(0.20)
Monopoly - Duopoly	-0.09	-0.14	0.35	0.17
	(0.45)	(0.26)	(0.55)	(0.21)
Facility FE's	X	X	X	X
Year FE's	X	X	X	X

Facility-level clustered standard errors in parentheses

Table 7: **Probability of Acquisition by Big 2**

This table presents logit estimation at the facility-year level for independent facilities at risk of acquisition. The dependent variable is an indicator (scaled to percentage points) for whether either of the Big 2 acquires the facility in that year. Single-Facility County are those counties which only have a single facility, so a Big 2 acquisition will become a monopoly by default. One Big 2 Chain, Last Indep. are those independent facilities where all other facilities in the county are owned by one of the Big 2. Both Big 2 Chains, Last Indep. are those independent facilities where both Big 2 firms are present and all other facilities are owned by the Big 2. Patient volume and total stations are lagged one year. Standard errors are clustered at the county level.

	Pr(Acquired by D/F in year t): Logit APEs (%, pp)	
	(1)	(2)
Single-Facility County	1.01***	0.85***
	(0.27)	(0.25)
One Big 2 Chain, Last Indep.	2.14***	1.82***
	(0.53)	(0.49)
Both Big 2 Chains, Last Indep.	2.74**	3.05**
	(1.35)	(1.52)
log(# patients), $t-1$	0.36***	0.27***
	(0.09)	(0.09)
Total Stations, $t-1$	0.01	0.01
	(0.01)	(0.01)
Sample Mean (pp)	2.14	2.14
Observations	34,763	34,763
Acquisition Events	743	743
Ownership-Type Dummies	X	X
Year FE		X

County-clustered delta-method standard errors in parentheses

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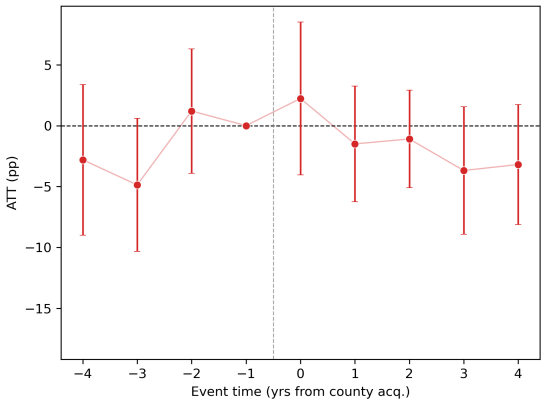
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A Additional Figures and Tables

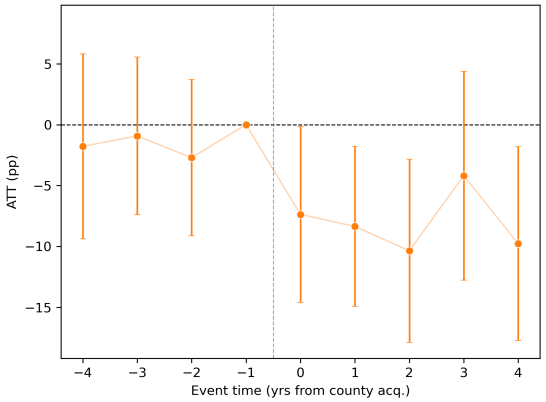
Figure A1: **Callaway and Sant'Anna Test**

This figure presents the survival dynamics within county by market type pre and post acquisition. We follow the methodology of Callaway and Sant'Anna (2021). For this figure, we limit the analysis to only those counties which experience a single acquisition during our sample. Confidence intervals are presented at the 95% level, clustered at the county level.

Panel A: Monopoly Acquisitions



Panel B: Duopoly Acquisitions



Panel C: Competitive Acquisitions

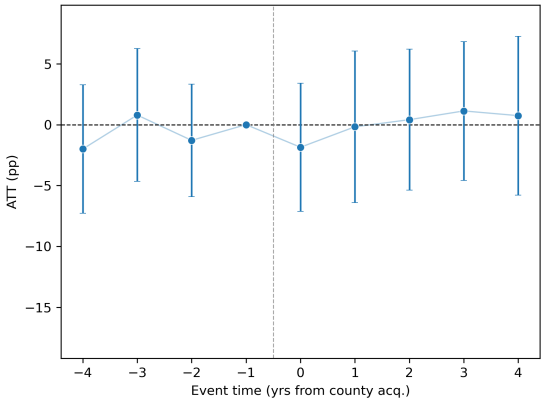


Table A1: **Survival Robustness**

This table mirrors Table 2, but with an additional control interaction under which the "Post-Acq." dummy variable with the number of facilities in the county at the time of acquisition.

	Survives For (%)	
	365 Days	730 Days
Monopoly × Post-Acq.	-1.91**	-2.85***
	(0.93)	(0.98)
Duopoly × Post-Acq.	-4.13***	-3.75**
	(1.58)	(1.73)
Competitive × Post-Acq.	0.68	0.29
	(0.90)	(0.98)
Post-Acq. × # Facilities	0.01	0.02
	(0.02)	(0.02)
Sample Mean	63.27	50.02
Observations	914,583	914,583
Adj R-squared	0.045	0.053
Monopoly - Competitive	-2.60**	-3.14**
	(1.26)	(1.35)
Duopoly - Competitive	-4.81***	-4.05**
	(1.78)	(1.95)
Monopoly - Duopoly	2.22	0.91
	(1.82)	(1.97)
Controls	X	X
Facility FE's	X	X
Year FE's	X	X

Facility-Level Clustered standard errors in parentheses