

Mergers in Medicare Part D: Decomposing Market Power, Cost Efficiencies, and Bargaining Power

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Abstract

We examine horizontal mergers amongst Part D insurers with the aim of decomposing market power, cost efficiency, and bargaining power effects. We apply a differences-in-differences identification strategy to panel data on plans offered between 2006 and 2012 to analyze the effects of mergers on plan premiums and coverage characteristics related to drug access and drug pricing. The results reveal significant market power raising premiums, but only in markets where the merging firms overlap. Mergers alter the bargaining process with drug suppliers, invoking a tradeoff between drug access and drug pricing. Merging firms realize large bargaining gains when they restructure the firm by consolidating plans. Plan consolidation also stimulates cost efficiencies, even when carried out organically by non-merging insurers. Otherwise, mergers have no cost efficiency effects.

1 Introduction

The landscape of competition in the health insurance industry has experienced many changes in the past several years, starting with the introduction of managed care plans in the 1980s, privatized Medicare plans, expanded prescription drug coverage, and most recently the reforms in the 2010 Patient Protection and Affordable Care Act. Throughout this period there have been waves of merger and acquisition (M&A) activity as insurers adapted to the evolving marketplace (Park and Town, 2014).

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In this paper, we examine the effect that horizontal M&A activity amongst health insurers has on prices and coverage characteristics of prescription drug plans offered in the Medicare Part D market. Part D established a regulated and subsidized insurance exchange for Medicare beneficiaries to purchase prescription drug coverage from competing private insurers. It is the largest health exchange in the U.S., insuring over 40 million individuals. Since the program's inception in 2006, there have been more than a dozen large scale horizontal M&A deals involving the parent companies of insurers offering Part D plans. Twenty three of the top 25 Part D insurers have gone through at least one horizontal merger. Each year, M&A deals affect an average of 15% of all plans in the market. More, even larger deals are on the docket that involve the "Big Five" insurance carriers including, Humana, the last major hold-out to a merger.

Theory posits three major channels through which mergers affect markets. First, horizontal mergers increase market concentration which gives firms more market power. Reduced competition can lead to higher premiums for consumers or lower product quality if firms compete on quality dimensions. The program rules regulate general coverage parameters such as deductibles. However, Part D contracts vary considerably along other coverage dimensions that could be eroded by market power: namely, drug access (the comprehensiveness of formulary coverage) and drug pricing which determines the amount enrollees pay out-of-pocket in copays. Second, horizontal mergers offer benefits if they result in increased productive efficiency. In health insurance, efficiency gains can be achieved through scale economies that appear as insurers streamline their administrative and marketing activities. These cost have taken on a greater importance as new minimum loss ratios (MLR) in the Affordable Care Act require 85% of premium dollars to be spent on drug claims, leaving only 15% available for administrative and marketing expenses. Third, horizontal mergers alter bargaining dynamics with upstream suppliers as the combined firm gains monopsony power. For health insurers the upstream suppliers are the providers of healthcare goods and services (doctors, hospitals, drug manufacturers, and pharmacies). With greater bargaining power, an insurer may be able to negotiate more favorable coverage terms and lower its cost. This merger effect is particularly important in Part D. The program relies heavily on the ability of private insurers to bargain with drug suppliers and explicitly prohibits the government from participating in negotiations (Duggan and Scott-Morton, 2010; Frank and Newhouse, 2008). Mergers could have a positive effect if the increased bargaining power allows insurers to increase the scope of covered drugs or negotiate lower drug acquisition costs, which can be passed to enrollees either directly through reduced cost sharing on drug copays or indirectly through lower insurance premiums.

These deals have come under the scrutiny of anti-trust authorities. They are tasked with

determining whether the beneficial effects of mergers (cost efficiencies and bargaining power) in fact exist, and if so, whether they outweigh negative market power effects. So far, there has been virtually no anti-trust or regulatory action to block or restrain merging insurers. Stylized facts about Medicare Part D give reason for concern. Since the program's inception in 2006, premiums increased by more than 26% in real terms through 2012. While the typical consumer still has many choices —an average of 25 plans available in each market —there has been a drastic 31% decrease in the number of plan offerings. Coverage has declined and drug costs have risen. The number of drug offerings on plans' formularies has fallen by 29% and out-of-pocket costs paid by enrollees for the most popular drugs has nearly doubled. The latest government projections forecast a 6.5% annualized per capita cost growth rate for the Part D program, exceeding the growth rate for other categories of medical spending.¹ Understanding whether mergers contribute to or thwart these glooming trends is critical for the viability of the program.

The Part D market has experienced not only a wave of mergers, but also a flurry of plan consolidation. Insurers frequently consolidate two or more plans offered in the previous year into a single plan offering for the upcoming year. In any given year, about 20% of renewed plans are consolidated. Most of the decrease in the number of plans can be attributed to insurers consolidating their plans, not terminating plans. To distinguish terminology, mergers can be thought of as *inter*-firm combinations; plan consolidation, as *intra*-firm combinations. The distinction is important for anti-trust and regulatory purposes. In 2011, Medicare began publishing guidance to encourage insurers to consolidate low enrollment and “meaningfully” similar plans. As of 2015, Medicare has been evaluating proposals for more stringent rules that would force greater consolidation. If an insurer can realize the beneficial effects of mergers (cost efficiencies or bargaining power) by organically consolidating its own plans without engaging in a merger with an outside firm, then there is a weaker case to be made in favor of mergers and stronger case for mandating reductions in the number of plans per insurer.

Our empirical methodology explicitly distinguishes mergers from consolidation to test whether the purported effects of mergers only appear through external mergers or can be achieved internally. We also test for synergy effects when merging firms consolidate plans. Mergers that occur with a concomitant consolidation of plan offerings may realize greater bargain and cost efficiencies gains by restructuring the combined firm's business activities and allay skeptics concerns that the firms merged with the sole intent of exploiting market power.

¹Source: 2015 Annual Report of the Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds, Table III.D4.

In our application to Medicare Part D, we analyze the effects that horizontal mergers have on market outcomes with the aim of separating the three channels through which M&A activity affects plans: cost efficiencies, bargaining power with upstream drug suppliers, and market power. We use panel data on all plan offerings between 2006 and 2012 (9,000 plan-year observations) and consider two types of outcome variables: prices (premiums) and plan coverage characteristics. Specifically, we focus on measures of coverage access —the number of drugs covered on insurers’ formularies and usage restrictions that insurers adopt to limit drug access —and drug pricing —out-of-pocket costs for the top 100 drugs and copay pricing tiers (i.e. preferred, non-preferred, speciality). The effects of mergers on coverage are just as important as those on premiums because coverage terms are heavily determined by the bargaining process between insurers and drug suppliers. The coverage outcomes provide more robust evidence on bargaining power effects than can be gleaned from premiums and constitute an important contribution to the merger literature which often lacks detailed analysis of product characteristics. The rich multi-dimensional measures of coverage allow for an in-depth analysis of the quite complicated bargaining process between insurers and suppliers in which coverage terms, beyond just drug prices, are being negotiated.

To identify the treatment effect that M&A deals have on plans we use a differences-in-differences approach. In our first specification, we examine how plans affected by a merger change in the year following a merger as compared to the control group of plans unaffected by mergers. This approach measures the combined effect of all three channels, revealing whether the beneficial effects of mergers outweigh the negative effects. For anti-trust purposes, this tests provides perhaps the most important metric for evaluating merger outcomes. However, there are limitations; simply comparing outcomes of merged and non-merged plans is not informative about the magnitudes of the three competing effects. For example, if the results were to reveal no effect of mergers on prices, that could indicate each of the three channels has zero effect or it could be indicative of large market power effects that are canceled out by equally large cost efficiency and bargaining power effects. Moreover, this test indicates nothing about whether the benefits of mergers can be achieved internally through plan consolidation nor does it provide guidance about how specific characteristics of a merger deal affect outcomes.

In our second specification, we begin sorting out the three merger effect channels. We exploit variation in the market overlap of merging insurers to distinguish local merger effects from national merger effects. The majority of merger deals involve near-national insurers operating in many geographic markets delineated by state boundaries, but not necessarily all of them. According to the program design, insurance plans are priced at the local level. In overlapping markets where both firms operate, merging parties coordinate pricing decisions

which gives rise to a market power effect. In non-overlapping markets where only one of the merging firms operates, a merger effect could only be produced at the national level through cost efficiency or bargaining channels. Mergers can affect cost efficiencies at the national level because many marketing and administrative costs are national in scope. The bargaining process with suppliers is more nuanced. There can be local and national effects. At the national level, insurers bargain with manufacturers of branded and generic drugs over coverage terms: inclusion on formularies, copay rates, usage restrictions, and drug prices. Given all drugs are available nationally, there may be national bargaining power effects that would appear in both the overlapping and non-overlapping markets of a merger deal. At the local level, there may be bargaining effects that involve regional drug wholesalers and pharmacies that would be specific to overlapping markets.

In our third specification, we modify the differences-in-differences set up to distinguish *intra*-firm plan consolidation from *inter*-firm mergers. Like a merger, plan consolidation could affect market power, cost efficiencies, and bargaining power. We are interested in comparing similarities and contrasting differences between consolidation and merger effects, which is useful for determining whether regulatory decisions should promote/discourage mergers or consolidation. We hypothesize that plan consolidation first and foremost operationalizes cost efficiencies and secondarily alters market power and bargaining power. When an insurer consolidates plans, it is by definition reducing its number of plan offerings which could economize on administrative and marketing costs. A market power effect could arise because the removal of a plan limits cannibalization of market shares across a multi-plan insurer's plan offerings. Consolidation could also impact bargaining positions with drug suppliers to the extent that plan-level enrollment, not just carrier-level enrollment, matters for bargaining. In our final most refined specification, we interact merger and consolidation effects to test whether synergies of the merger deal exist when merging insurers consolidate their plan offerings in overlapping markets. We view plan consolidation of merging insurers as a form of restructuring that could operationalize the cost efficiency and bargaining benefits over and above those that the merging insurers could achieve if they continue to operate as separate business units.

Our results show that mergers have a strong market power effect on premiums that rise by an average of 5%. The market power effect is local; premiums only rise in overlapping markets in which the merging parties compete head-to-head. There is a slight drop in premiums in non-overlapping markets where only one of the merging firms operates, which indicates that mergers generate negligible national-level cost efficiencies. There is little evidence that mergers improve drug access or reduce cost when averaging across all of the plans affected by a merger in Part D. However, interesting bargaining power effects emerge in a comparison

of overlapping and non-overlapping merger markets, shedding light on how the complicated bargaining process works in Part D. Drug access is largely determined at the national level while drug price concessions are determined at the local level. In non-overlapping merger markets, formulary comprehensiveness (the number of covered drugs) and usage restrictions improve, but out-of-pocket drug costs rise indicating that insurers cannot harness lower drug acquisition prices. In overlapping markets, merging insurers are able to offset those drug price increases, indicative of local bargaining power gains; however there is a deterioration in formulary comprehensiveness and usage restrictions which could be attributed to market power effects diminishing coverage quality. These results suggest anti-trust authorities should scrutinize merger deals involving a large amount of market overlap for market power and be skeptical of cost efficiency claims. They should weigh a tradeoff between coverage access and drug prices in their assessment of bargaining gains.

The results for plan consolidation stand in stark contrast to those for mergers. Premiums of consolidated plans decrease by an average of 9.6%, larger in magnitude than the price increase attributed to mergers. In other words, cost efficiencies arise through plan consolidation, not merger. The premium decrease can be primarily attributed to marketing/administrative cost efficiencies. We find little evidence of a bargaining power effect; coverage quality with respect to drug access and price decreases modestly. However, we find a very large effect on coverage when merging insurers engage in plan consolidation. All measures of drug coverage improve dramatically. Premiums rise by a smaller amount than in mergers without consolidation. These results suggest merger deals that involve plan consolidation bring about meaningful bargaining power gains that improve coverage. It may be enough to allay anti-trust concerns about market power in merger deals with significant market overlap.

As robustness, we consider two alternative explanations for our results related to adverse selection and gaming of the subsidy design. Part D has an intricate system of risk adjustment payments to combat adverse selection and equalize cost regardless of whether a plan selects a high or low risk pool of enrollees. However, plans that offer enhanced coverage over and above the basic benefit parameters do not receive risk adjustments for the enhanced elements of coverage. Evidence from micro-data on risk selection suggests enhanced plans are being forced out of the market to reduce adverse selection (Polyakova, 2015). Part of the large wave of consolidation during our sample period involves insurers converting enhanced plans into basic plans. The conversion could reduce insurers' cost of insuring these high risk enrollees by shifting them out of partially risk adjusted enhanced plans. If this is the case, adverse selection, not just intrinsic cost efficiencies, could account for the large premium decreases of consolidated plans. We separate out the effects of consolidation for basic plans that are

fully risk adjusted and enhanced plans that are partially adjusted and find that about half of the cost effect is an artifact of reduced selection, but the cost efficiency effects still exist.

Part D is a highly subsidized market with special subsidy rules for the low income segment of the population in the low income subsidy (LIS) program. In our primary specification we include an extensive set of control variables related to the LIS program to account for the effect that LIS rules have on pricing and coverage. Decarolis (2015) shows how plan consolidation —one of our main treatments of interest —can be used by insurers to strategically game the LIS subsidy design to raise premiums. We modify our tests for consolidation and mergers to separate out LIS “benchmark” insurers with an incentive to game the design. We find that consolidation by these insurers contributes to higher premiums, however our more general result about consolidation lowering premiums remains. Market power effects are weaker in mergers between LIS benchmark insurers.

2 Healthcare Competition Literature

Economists have long been concerned about whether healthcare markets are competitive and, if so, whether unfettered competition achieves desired outcomes. Ellis (2012) cites evidence of high levels of concentration and raises concerns about market power in both provider markets (hospitals, physician networks, pharmaceuticals) and insurance markets. Apart from market power, two other channels —cost efficiencies and the balance of bargaining power in the vertical relationship between insurers and healthcare providers —determine the performance of markets. This paper contributes to the literature by decomposing these three channels as they apply to health insurance markets. Merger studies provide an excellent avenue for analyzing competition because merger events change the industry structure.

The literature on health insurance posits that an insurer’s scale, measured by enrollment, is an important determinant of its cost efficiency. There is a strong correlation between scale and insurance loads: the difference between what is collected in premiums and paid out in benefits. For employer-sponsored health insurance plans Karaca-Mandic et al. (2011) document loads ranging from 4% for the largest insurance plans with over 10,000 enrollees to over 40% for the smallest with under 50. In Part D, the size of plans spans the same range. A leading cause is that large insurance plans economize on administrative costs. In Part D, they may be particularly high due to Medicare’s stringent compliance and reporting standards and the added complexities of real-time pharmacy claims processing at the point of sale. In the Medigap market, insurers have high loads because of marketing costs (Starc, 2014). Insurers use the same marketing tools for their Part D plans. Horizontal mergers may have tremendous benefits if the increased scale of merging insurers reduces administrative

and marketing costs. Legislation in the ACA aims to reduce loads by imposing minimum loss ratios (MLR) on insurers. Starting in 2014, MLRs will be implemented in Medicare Part D. Mergers may be one of the most effective ways for insurers to reduce costs so that they can meet the new MLR requirements.

The next channel we consider is the vertical market relationship between insurers and providers. The industry has shifted towards a model where insurers selectively contract with providers through a bargaining process. Insurers decide which providers to include in their network, providers decide which networks to join, and the two parties negotiate over reimbursement rates and the terms of enrollee cost sharing. There is a large literature on bargaining from the perspective of hospitals (Ho, 2009; Ho and Lee, 2015; Gowrisankaran et al., 2015; Lewis and Pflum, 2015a), but less is known about the insurance side, particularly for prescription drugs. Conceptually, the bargaining process in Part D is unfathomably complicated because there are thousands of manufacturers and pharmacies at the bargaining table negotiating over a multitude of contract terms including formulary inclusion, drug prices, copay rates, and usage restrictions. Brown et al. (2014) shows how insurers are able to manipulate these complicated contract terms to cream-skim improperly risk adjusted enrollees, and Carey (2014) provides evidence from Part D that copay rates are the primary tool for cream-skimming. Otherwise, little is known about how insurers use these contract terms as bargaining levers. Evidence from the early years of the program has shown that bargaining led to significant reductions in drug prices for non-protected therapeutic classes (Duggan and Scott-Morton, 2010) that, in the aggregated, lowered drug price levels for the Medicare population (Duggan and Scott-Morton, 2011).

Our study allows us to gain a greater understanding of how insurer competition impacts the bargaining process. Mergers alter bargaining positions. The number of people enrolled by the insurer determines the threat point in the Nash bargaining models applied to the industry. Insurers can expand their base of enrollees through merger to gain greater bargaining power. We show how bargaining gains translate into a combination of lower premiums, expanded drug access, and reduced cost sharing for enrollees. Our analysis decomposes the effects for each of the contract terms, revealing how they are used as bargaining levers. We also provide evidence about the effects of plan consolidation, which makes plans larger but doesn't change the size of the insurer, on bargaining power. Our distinction between overlapping and non-overlapping merger markets allows us to determine whether there are national or local level bargaining effects, much in the same spirit as Lewis and Pflum (2015b) who find bargaining gains in out-of-market hospital merger deals.

The healthcare merger and competition literature has extensively explored hospital mergers. We contribute to a more scarce literature on health insurers. Two of the most compre-

hensive studies are Dafny (2010) and Dafny, Duggan, and Ramanarayanan (2012). Dafny (2010) uses a large panel of insurers offering plans in the employer sponsored health insurance market to investigate whether health insurers have market power. The authors find non-trivial market power as evident in their ability to price discriminate by charging higher premiums to more profitable employers, particularly in highly concentrated markets. A similar conclusion is reached by Bates et al. (2012) who find higher prices and lower rates of health insurance enrollment in more concentrated markets. Dafny et al. (2012) employ the same data set as Dafny (2010) to study the effect of concentration on premiums and reimbursements to physicians and nurses. They focus on the 1999 merger of Aetna and Prudential, two of the largest insurers in their sample. The deal between them resulted in a sharp change in the Herfindahl-Hirschman concentration Index (HHI) and represents a plausible exogenous shifter of market concentration. Their estimates show that the average market-level changes in HHI between 1998 and 2006 caused a 7 percentage point increase in premiums. They also find evidence of increased bargaining power with health care providers; payments to physicians and nurses decreased by 2% to 3% over the same time period.

We build on Dafny et al. (2012) in two important ways. Our first contribution is to disentangle the three merger effects. Their results show market power dominates, but are less informative about the extent to which the merger created cost efficiencies or altered bargaining power. Second regards the data. Whereas they examine just one merger case, we use panel data that includes all merger activity between 2006 and 2012. The high churn rate of mergers yields a large treatment group of plans affected by a merger and a control group of plans unaffected by a merger which allows us to use a differences-in-differences approach to identify merger treatment effects. We also have detailed plan-level data on coverage characteristics, not just premiums, that we consider as merger outcomes. This is important as both premiums and the terms of coverage are jointly determined in insurance contracts.

The effect of mergers on market performance is also an important topic in the finance literature. While we address the question using product-level data, much of the research in finance uses event studies applied to a set of multiple M&A deals. Most closely related is Fee and Thomas (2004) that specifically aims to identify how mergers affect market power, cost efficiencies, and vertical bargaining power. They use a large cross-industry sample of deals from 1980 to 1997 and examine stock price movements for the merging firms, horizontal rivals, and upstream suppliers. Maksimovic et al. (2011) examine post-merger plant closures and restructuring of supplier contracts as means of improving efficiency. The analog to plant closures and restructuring in our paper is plan consolidation.

Finally, our paper contributes to a growing literature on Medicare Part D. Several papers

(Lucarelli et al., 2012; Miller and Yeo, 2015a; Ericson, 2014; Decarolis, 2015; Miller, 2015) examine firm conduct and competition, including important institutional details related to subsidies and market regulations. We contribute by analyzing competitive and cost-side effects of mergers and plan consolidation. Another strand of the literature (Abaluck and Gruber, 2011; Ketcham et al., 2012; Kling et al., 2012; Heiss et al., 2013) uses individual level data on consumer choice and finds evidence that enrollees make poor plan choices. These studies have been influential in guiding policy decisions. The consumers’ choice problem could be eased by reducing the number of available plan offerings. Standing proposals to reduce choice involve consolidation of either low enrollment plans or plans with “meaningfully similar” coverage characteristics. Other proposals would limit the number of plans sponsors that can participate in Part D or restrict the number of plans an insurer can offer. The question for regulators becomes a matter of how to implement policy to reduce choice—whether it be adopting a tolerant stance towards mergers to reduce the number of participating sponsors or promoting plan consolidation—in a way that does not compromise competition and coverage quality. This study informs the issue by showing the effect that mergers and consolidation have on premiums and coverage.

3 Medicare Part D Background

Medicare Part D introduced a prescription drug benefit to the Medicare program. It was authorized under the 2003 the “Medicare Prescription Drug, Improvement, and Modernization Act” and fully enacted in 2006. The legislation created a coverage mandate requiring beneficiaries to obtain prescription drug coverage when they first become eligible for Medicare or face penalties for late enrollment. The act established a regulated and subsidized health insurance exchange where beneficiaries can choose amongst plans offered by competing private insurers. The prescription drug plans offered in this exchange are the focus of our study. About 60% of the Medicare population is covered by a Part D plan; the remainder either lack coverage or obtain prescription coverage through other means such as employer/retiree benefits or another government program.

The Part D exchange was designed to rely on free market principles to provide competitively priced drug plans with attractive coverage. The benefit is offered by private insurers who may freely enter and exit the market, choose the number of plans to offer, and set monthly premiums. The government subsidizes premiums, facilitates risk adjustments, and sets a minimum coverage standard. Provided that the standard is met, insurers are largely responsible for the benefit design. Each insurer selectively chooses which drugs to cover on its formulary and sets cost sharing copay/coinsurance rates on a drug-by-drug basis.

Drug prices are determined through a bargaining process between insurers and drug manufacturers, wholesalers, pharmacies. Per regulation, negotiated prices must be passed on to enrollees. This is seen as a controversial feature of the program because the legislation explicitly prohibits the government from being involved in price negotiations with the pharmaceutical industry (Frank and Newhouse, 2008) as is the case for other government drug benefits such as Medicaid.

The regulations establish a set of coverage standards. All providers are required to offer at least one basic plan that meets (or is actuarially equivalent to) a minimum coverage level with respect to the deductible, coinsurance and copay rates, and the scope of drugs covered on the formulary. In addition to a basic plan, insurers may offer enhanced plans that have more generous coverage through a combination of lower deductibles, lower copay/coinsurance rates, and drug coverage for a larger set of medical conditions. Low income beneficiaries qualify for additional premium and copay subsidies over and above those available to all beneficiaries.

Plans have a large toolbox of “formulary management” techniques that they can use as bargaining levers with drug suppliers and as a means to steer enrollees’ usage of drugs. With the exception of six therapeutic classes, they are allowed to selectively choose which drugs to include on their formularies, place drugs on pricing tiers such as “preferred,” “non-preferred,” and “specialty,” as well as impose usage restrictions in the form of quantity limits, step therapy routines, and prior authorization requirements. These techniques are thought to be important tools for negotiating favorable drugs prices, which will ultimately be reflected in the generosity of plans coverage and premiums.

Nearly all major health insurance companies and many regional insurers entered the Part D market in the first two years of the program. There has been almost no entry in later years. Geographically, the market is separated into 39 markets drawn around state boundaries. Insurers offer and price plans individually for each market. In the typical market, enrollees can choose from about 40 plans offered by 20 insurers.

4 Data

We utilize detailed longitudinal data on plans that includes an average of 1,500 stand-alone, Part D plans (PDPs) per year. We exclude Medicare Advantage plans that bundle Part D coverage with other Medicare coverage components. The data span seven years from 2006 when Medicare Part D was introduced until 2012 and cover all 39 geographical markets. The sample is constructed using both publicly available and restricted use data obtained from the Centers for Medicare and Medicaid Services (CMS).

Enrollment in stand-alone Part D plans has grown from about 17 million in 2006 to over 20 million by 2012. The average plan has 11,592 individuals enrolled per year. However, the plans differ significantly on this margin. There are plans that have fewer than 10 insured, while others insure more than 300,000 individuals. About 40% of the enrollees receive additional premium and copay subsidies through the low income subsidy (LIS) program. Table 1 presents information on market level trends. In the first year of the program, there were only 1,446 plan offerings, which rose to 1,900 in the second year. But following 2007, the number of plan offerings has steadily decreased down to 995 by 2012. Much of this decrease can be attributed to plan consolidation. During the sample period, average premiums increased by 26% in real terms (by 43% in nominal terms), and the average plan’s market share increased 37%.

Table 1: Medicare Part D Market Trends: 2006-2012

	2006	2007	2008	2009	2010	2011	2012
Plan-level data							
Monthly premium (\$2012)	42.55 (14.60)	40.62 (16.70)	42.50 (21.21)	48.85 (22.12)	48.99 (20.75)	54.88 (25.90)	53.41 (26.72)
Market share, in %	0.93 (1.79)	0.71 (1.63)	0.72 (1.55)	0.75 (1.50)	0.81 (1.56)	1.23 (2.41)	1.27 (2.27)
Enrollment	10,730 (25,159)	8,469 (23,060)	8,778 (21,056)	9,329 (21,783)	10,387 (23,700)	16,154 (37,149)	17,297 (36,155)
LIS enrollment	5,588 (13,368)	4,194 (13,817)	4,278 (11,493)	4,346 (12,314)	4,899 (14,401)	7,677 (20,314)	8,069 (20,431)
Insurer-level data							
Regional presence	27.60 (10.80)	29.61 (10.21)	30.04 (10.39)	30.44 (9.95)	29.99 (9.61)	29.35 (3.58)	28.73 (10.38)
Part D region-level data							
N plans offered	37.08 (13.82)	54.36 (6.74)	52.97 (6.30)	46.38 (5.56)	43.43 (5.29)	26.51 (8.65)	25.51 (8.74)
Eligible population, in'000	1,275 (951)	1,280 (964)	1,304 (988)	1,328 (1,010)	1,363 (1,026)	1,398 (1,051)	1,480 (1,104)
N regions	39						
N plans offered	1,446	1,908	1,778	1,627	1,519	1,034	995
N plans affected by merger	293	2	505	173	82	204	204
N plans merged in overlapping mkts	188	0	374	170	10	191	191

Notes: The table includes all plans on the market, including renewed, consolidated, new, and terminated plans in the next year. Number of plans affected by a merger counts the number of plans in year t that belong to one of the merger parties in a deal finalized in $t - 1$. Standard deviations are in parentheses.

We collect information on each plan’s premium, deductible, gap coverage, and drug formulary. Table 3 reports summary statistics on the plan-level data for 2006-2012. A plan’s *premium* is set once a year, when insurers submit their bids for contract with Medicare. The deadline to submit bids is the first Monday in June each year. The open enrollment

period runs from October through December, and the contract year begins January 1st. Premiums are paid monthly by the insured. Qualified individuals are provided with the “Extra Help”, or low-income subsidy (LIS) by Medicare. This LIS program covers in full or partially the monthly premium amount, deductible, copayments and coinsurance, and eliminates the coverage gaps.

The *deductible*, followed by the *initial coverage zone*, is the amount the insured must pay out-of-pocket before cost-sharing kicks in. The yearly deductible for what Medicare determines as the standard Part D benefit was set to \$250 in 2006. Updated using annual percentage increases, it was raised to \$320 by 2012. Most enhanced PDPs eliminate the deductible so that the enrollee receives first dollar coverage.

The gap in coverage or “*donut hole*” begins when the insured reaches the limit on the expenses covered by the initial coverage zone. Prescription costs beyond the limit (\$2250 in 2006) and below the “catastrophic” level (\$5100 in 2006) are paid by the insured out-of-pocket. Many enhanced PDPs provide full or partial coverage in the donut hole. The ACA legislation began a phase-out of the donut hole in 2011. It will be completely closed in 2020.

The *formulary* is a comprehensive list of the medicines covered by the plan, identified by the National Drug Code (NDC).² The formulary files contains data on the drug’s tier, usage restrictions, and copay/coinsurance provisions that determine the cost to a beneficiary. The formulary file is complemented with drug pricing data that was first published in 2009. The pricing data contain information on the average drug prices for every drug and plan. Specifically, the reported price is the average transaction price, net of all rebates for a 30-day supply filled at the plan’s preferred pharmacies in the third fiscal quarter of each year.

To measure the comprehensiveness of formulary coverage, we count the number of drugs listed on the plan’s formulary. The first measure counts the number of top 100 drugs. In early years, the average plan covered more than 90 of the top 100 and fell to 75 by 2012. The second measure counts the total number of NDCs on a formulary which plans select from a set of 5,300 unique drugs that qualify for coverage under Part D.³ Like the top 100 drug, the total number of covered NDCs fell throughout the sample period.

Part D formularies typically have three to five *pricing tiers* that separate preferred drugs with relatively more favorable coverage from non-preferred ones. Lower tiers indicate better coverage. For example, a three-tier plan that has 1/3 of its drugs on tier 1, 1/3 on tier 2, 1/3 on tier 3 has an average pricing tier of 2. Since the plans differ in the number of tiers (up to 7 tiers), for the purposes of comparison we normalize a 2 on a scale of 1 to 3, to 0.5

²NDC is an 11-digit classification issued by the Food and Drug Administration (FDA) for all the approved drugs. Under this system, different package and dosage sizes of the same drug molecule have separate NDCs.

³The method for counting NDCs changed after 2006. In 2006, identical drugs made by different manufacturers were “double-counted” as distinct drugs. Identical drugs were only counted once from 2007 onward.

on a 0 to 1 scale. The formularies also might have up to three types of *restrictions* placed on drug consumption: step therapies, prior authorization, and quantity limits. We sum up the restrictions and calculate the average number of restrictions on a formulary using a 0 to 3 scale.

We use drug prices and cost sharing rates to construct a price index to compare out-of-pocket copay prices across plans. This is our most refined measure of the generosity of plan coverage. It is constructed by using actual copay/coinsurance rates and pharmacy prices to calculate the out-of-pocket price an enrollee pays in the initial coverage zone for a basket of the top 100 drugs ranked by the number of prescriptions filled. These hundred drug prices are combined into a price index, where each drug is weighted equally. If a drug is not covered on the formulary, the enrollee has to pay the full retail price out-of-pocket. We set the retail price for uncovered drugs to the average pharmacy price in the region. Three sources of variation affect the out-of-pocket price index: number of covered drugs, drug pricing tiers, and a plan's negotiated price with the pharmacy and drug manufacturer. Greater formulary comprehensiveness, lower pricing tiers, and lower negotiated pharmacy prices all contribute to a lower value of the out-of-pocket price index.

The *benchmark* indicator variable relates to the Low Income Subsidy (LIS) program. Benchmark plans are a subset of basic plans that are priced below a market weighted average price of basic plans. Benchmark plans qualify for the full amount of the low income premium subsidy. They also qualify as default plans for Medicare/Medicaid dual eligible beneficiaries. Dual eligibles—who account for about 20% of the Medicare population and 40% of Part D enrollment—are randomly and uniformly assigned to an LIS benchmark plan as their default if they don't otherwise actively select a plan. Given the large number of dual eligibles, LIS benchmark plans receive a big boost in enrollment from random assignment, which creates a large discontinuity in demand at the benchmark level.

4.1 Data on M&A Deals

We collect data on M&A activity from the Securities Data Company (SDC) merger and acquisition module which contains detailed information on all deals involving public and private companies. In the time frame suitable for our analysis, from 2006 to 2011, we identified a total of 11 completed horizontal M&A deals amongst companies that offer Medicare Part D policies. Table 2 lists the details on each of the selected deals. All of the deals involve major Part D insurers that offer plans across the entire nation with the exception of the Medical Mutual of Ohio/ Carolina Care Plan acquisition. Note that some of the major plan providers were involved in multiple deals during the sample period.

Table 2: M&A Deals between Medicare Part D Providers in 2006-2012

N	Acquiror	Target	Value	Date	Form
1	United HealthCare Services	PacifiCare Health Systems	7,511	12.21.05	M
2	MemberHealth	AmeriHealth Ins Co-Medicare	N/A	11.16.06	AA
3	Medical Mutual of Ohio	Carolina Care Plan	N/A	05.18.07	AA
4	Universal Holding Corp	MemberHealth	780	09.21.07	AA
5	UnitedHealth Group	Sierra Health Services	2,425	02.25.08	M
6	CVS Caremark Corp	Longs Drug Stores Corp	2,637	10.30.08	M
7	CVS Caremark Corp	Universal American Corp	N/A	12.31.08	DJV
8	United HealthCare Services	Health Net-US Northeast	630	12.11.09	AA
9	HealthSpring	Bravo Health	545	11.30.10	M
10	Munich Health North America	Windsor Health Group	131	01.04.11	M
11	CVS Caremark Corp	Universal American Corp	1,059	04.29.11	M

Notes: The table shows all merger and acquisition deals where both parties offered plans in the Medicare Part D market between 2006 and 2012. The company names are listed in accordance with the SDC records. Merger value is in millions of dollars. The date is merger completion date. "AA" stands for acquisition of assets; "M" for merger; "DJV" for dissolution of joint venture.

We restrict attention to horizontal mergers and acquisitions of assets where either participants or their immediate subsidiary offered a Part D plan at least in the year prior to the merger completion date. We exclude all the deals where one or both companies belong to a non-Part D line of insurance (such as life insurance), joint ventures of Part D insurers into related lines of business (such as pharmacy benefit management), and vertical mergers with pharmacies. It is worth noting that we exclude a few large deals that took place in the second half of 2011 and in 2012 due to our assumption on the relative timing of the deal and its effects. The bids for each successive calendar year are submitted before the first Monday in June of the previous calendar year. Thus, for the deals completed prior to the deadline we measure the “before” period as the current calendar year and “after” as the following calendar year assuming that their bid will reflect the effects of merger. For example, case A in Figure 1 demonstrates a merger that was completed prior to first Monday in June of year (t-1). In this case, year (t-1) will represent the “before” period and year (t) - the “after” period. The merger from case B was completed after the bid date. It means that its “before” period is year (t) and “after” period is year (t+1). We also go through the news reports and companies’ press releases for each of the 11 deals to obtain factual support to our assumption. The mergers that were completed after June 2011 when all the bids for 2012 calendar year had been submitted would require data from 2013. The latest CMS data available at the time of study are for 2012. Including these later deals, 23 of the top 25 Part D insurers have been involved in an M&A deal with the notable exception being the number 2 insurer, Humana.

We match the SDC data on deals to the plan-level data by company name. There are about 100 unique parent companies whose subsidiaries offer Part D plans during the sample period. Some parents control more than one insurance company. As multi-product firms,

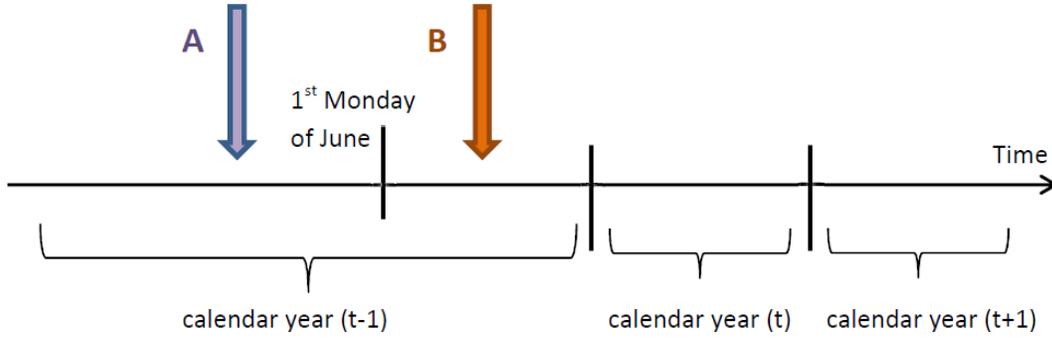


Figure 1: M&A deals timing with respect to the bid deadline date

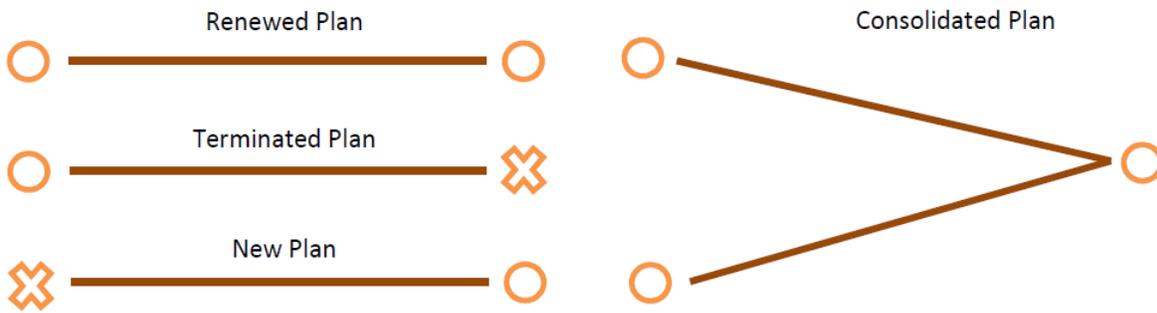


Figure 2: Plan transitions from year-to-year

insurers offer between one and three plans per region with the requirement that at least one plan qualifies as a basic plan.

We look at the short-term merger effects by comparing plans prices and coverage characteristics before and after the deal was completed. From year-to-year, plans can evolve in one of four ways as depicted in figure 2. Plans can be renewed, terminated, consolidated, or new plans can be introduced. To determine each plan’s transition status we use the CMS “cross-walk” file that links plans across years. Renewed plans carry-over enrollees from the previous year and typically maintain the same product segment: basic or enhanced status. However, plan characteristics such as the monthly premium, formulary list, and copay/coinsurance tiers, and drug prices can change across years. Terminated plans simply stop being offered for the new calendar year, and previously enrolled individuals have to actively select another plan. New plans are introduced to the market for the first time and they have no enrollees from the previous calendar year. Consolidated plans combine two or more plans from the previous year into one plan. Enrollees from the previous year’s plans carry over into the new plan. Like renewed plans, the product characteristics can differ from the previous year’s plan characteristics. Most consolidations combine two or more basic plans or two or more enhanced plans, but there are examples of cross segment, basic-enhanced consolidation.

Consolidation of plans is undertaken by merging firms as well as by firms that did not participate in a deal. We posit that the main reasons behind plan consolidation are to achieve cost efficiency gains and as a means for merging insurers to restructure their business activities. A similar idea is presented by Maksimovic et al. (2011). They find evidence of extensive restructuring in a short period following an M&A deal. In the sample of U.S. manufacturing firms, acquirors were likely to sell or close down targets' plants. It resulted in a boost in productivity in the retained plants comparing to the industry. Health insurance is fundamentally different from manufacturing in that terminating plans is highly undesirable because enrollees are lost. Part D insurers are better off consolidating plans when they want to restructure plans offerings to retain enrollees.

For our analysis we restrict attention to renewed and consolidated plans because our empirical method requires a plan to be observed for at least two consecutive years. By definition, terminated and new plans do not meet this criteria. Excluding them from the sample is unlikely to bias results because they compose such a small fraction of the market. Table 1 shows the total number of plans offered during the sample period in each year and the number of plans directly affected by an M&A deal. In each year, an average of 15% of all plans are affected by a merger. Table 4 shows how all plans and M&A affected plans evolve. Merging insurers engage in plan consolidation at an almost identical frequency to the rest of the market.

Table 4 also reports comparative summary statistics for the control group, plans unaffected by merger, and treatment group, plans offered by companies involved in a merger deal. The pre-merger plan characteristics of merger affected plans are generally similar to all other plans.

5 Estimation Strategy: Differences-in-Differences

To estimate the effect of mergers and plan consolidation, we use a differences-in-differences (DD) identification strategy. It is a popular method for identifying effects of policy “treatments” most often applied to household-level data in labor, health, and development economics fields (Bertrand et al., 2004). DD and treatment effect approaches are used less often for studies of the firm and in particular merger outcome studies. However, there are notable applications —Hastings (2004) (retail gas stations), Dafny et al. (2012) (health insurance), Allen, Clark, and Houde (2014) (banking), Lewis and Pflum (2015b) (hospitals), Ashenfelter, Hosken, and Weinberg (2015) (breweries). The detailed panel of product-level data and large sample of merger-“treated” plans make such a DD approach feasible and provide an attractive alternative to structural-based modeling and estimation of merger outcomes

(Angrist and Pischke, 2010).

5.1 Merger Treatment Effects

We construct several DD regressions to estimate the treatment effect of a merger on plan outcomes. Specification (1) considers the effect of mergers on the monthly premium, p .

$$p_{it} - p_{it-1} = \alpha + \beta D_{it-1} + (\mathbf{X}_{it} - \mathbf{X}_{it-1})' \beta + \mathbf{Z}'_{it-1} \beta + \varphi_{market \times year} + \varphi_{insurer} + \epsilon_{it-1} \quad (1)$$

where i indexes the plan, and t , the year. The merger treatment $D_{it-1} = 1$ if plan i was involved in an M&A deal that was completed in year $t - 1$, such that the effect of the merger would appear in year t . Note that the dating of deals is determined by the time line in figure 1 and does not necessarily match the calendar year in which the deal was officially announced. The plan characteristic controls in first differences $(\mathbf{X}_{it} - \mathbf{X}_{it-1})$ include various measures of plan design, excluding drug coverage outcomes. The pre-treatment plan characteristic controls in levels (\mathbf{Z}_{it-1}) include the variables in \mathbf{X}_{it-1} and drug coverage variables that could be potential outcomes of the merger. We include market-year fixed effects $(\varphi_{market \times year})$ in all specifications and insurer fixed effects $(\varphi_{insurer})$ in the most heavily controlled specification. The term ϵ_{it-1} is a plan-year specific error term. We apply the same DD approach to drug formulary counts, formulary restrictions, the out-of-pocket drug price index, and pricing tiers to estimate the effects of mergers on drug coverage outcomes.⁴

To identify the merger effect, we take advantage of the two dimensions present in the data: time and merger status. First, we look at the across time variation in outcomes, i.e. plan premiums immediately before the deal as compared to premiums immediately after. This comparison is possible if a plan is observed in the data for at least two consecutive years. For this reason, our sample includes renewed and consolidated plans, excluding new and terminated plans (see figure 2). The unit of observation is indexed to year $t - 1$ in equation (1). This timing issue matters for consolidated plans. For example if plans A and B sold in year $t - 1$ are consolidated into plan C for year t , there are two observations in the data for plans A and B in year $t - 1$. Observations of A and B may have different p_{it-1} and Z_{it-1} values in year $t - 1$, but will have the same p_{it} and Z_{it} values in year t because of consolidation.⁵ On the merger status dimension, we compare merger-affected plans to a

⁴For exposition we only show equations for premium outcomes, p , because the econometric specifications are otherwise identical for the drug coverage outcomes.

⁵Note that there is no “splitting” of plans. That is, plan A in year $t - 1$ cannot be split into plans B and C for year t .

control group of plans unaffected by an M&A deal. Combining both sources of variation in the DD estimator provides a very robust means of identifying average treatment effects.

To understand the intuition behind the DD approach, it is useful to separate the components of the estimator. Applying only one of the differences could result in confounded estimates of the treatment effect. In the raw data, a before and after comparison across time of average premiums for merger-treated plan shows a $(44.81-40.27=)$ \$4.54 *increase* in premiums caused by a merger (see table 4). A comparison of average premiums for merger (treatment group) and non-merger (control group) plans shows a $(44.81-45.16=)$ \$0.36 *decrease* in premiums caused by a merger.

Neither of these results necessarily measures the causal treatment effect. The increase indicated by time differencing could simply reflect an increasing time trend in premiums that affects all plans. Such a trend is plausible given plans not affected by a merger experience average premium increases of $(45.16-42.54=)$ \$2.62. The decrease indicated by differencing the treated and untreated group could be attributed to differences in unobserved plan and market characteristics of the two groups. The DD estimate of $(44.81-40.27)-(45.16-42.54=)$ \$1.92 controls for both confounding time trend effects and unobserved plan characteristics. The estimate of \$1.92 is the causal average treatment effect if firms' decisions about merging are orthogonal to plan and market characteristics. To control for selection on observables, we include first differences in plan characteristics ($\mathbf{X}_{it} - \mathbf{X}_{it-1}$) that are regulated by the Part D benefit parameters (basic plan status, deductible, gap coverage, LIS status) and not potential outcomes of the endogenous bargaining process between insurers and drug suppliers. For example, if merger-affected plans are more likely to lower the deductible between years than non-merger plans, the \$1.92 could simply reflect the fact that lower deductible plans are more costly for insurers. In robustness checks we relax the exogeneity assumption on basic plan and LIS status. The market-year fixed effects control for their respective correlation with mergers. The year component is needed because mergers do not all occur in the same year. From the data (table 1), mergers happened more intensively in the years following the 2010 health reform legislation, which itself may have altered trends in health insurance premiums. The market component controls for market characteristics, such as market structure (number of competing plans, market size) that could affect outcomes. The market-year fixed effects ensure treatment-control comparisons are made within the same market and year, not across markets and time (i.e. an M&A affected plan in Tennessee in 2008 as compared with an untreated plan in New Jersey in 2011). Note, unlike Dafny et al. (2012), we do not include measures of market concentration such as the Herfindahl-Hirschman Index (HHI) because they are controlled for by the fixed effects.

The DD estimate of the merger effect is the causal treatment effect if the decision to

merge is exogenous, conditional on the control variables and fixed effects. Two features of the insurance industry during this time period support the plausibility of merger exogeneity. First, the mergers in our sample involve large diversified insurance companies. Part D is just one component of these firms’ business activities, which suggests merger decisions are not entirely endogenous to the Part D market. Second, nearly every major firm offering a Part D plan has been involved in a merger since 2006. The high intensity of merger activity suggests merger decisions are not a matter of “if” a firm will merge, but rather a question of “when” it will merge. Matters of “if” firms merge raise concerns about whether the DD estimator measures causal treatment effects; matters of “when” the industry experiences merger waves are controlled for by the year fixed effects. Pre-treatment variables help control for the more difficult issue of “if” and “when” firms merge. There may be pre-treatment plan specific supply/demand shocks in the Part D product market affecting premiums and enrollment and likewise shocks in the upstream bargaining processes with drug suppliers influencing drug coverage. The rich set of pre-treatment plan variables (\mathbf{Z}_{it-1}) helps control for these shocks that may affect the timing of when a particular firm decides to merge. For example insurers that experience a down tick in market share are more likely to merge.

These justifications aside, we cannot rule out the possibility that there are other unobserved insurer characteristics correlated with a specific insurer’s decision to merge (or it’s decision to merge in a particular year). Our results should be interpreted as the average treatment effect for the mergers that endogenously occur in Part D. Our most heavily controlled specifications include insurer fixed effects to explore robustness with respect to the identity of merging insurers. Insurer fixed effects control for factors that might explain why CVS Caremark frequently engages in horizontal mergers and, an otherwise similar insurer, Humana does not.

Interpreting the DD estimates requires care because of equilibrium effects and the possibility of multiple merger events occurring simultaneously in the same time period. In the product and upstream supplier market, equilibrium effects can cause a merger event to have an effect on all plans in a market, not just plans sold by the parties to the merger. In the product market, Bertrand pricing models of differentiated products predict that all firms, including rivals to merging parties, gain market power when a merger increases market concentration. Likewise, mergers can alter bargaining power with upstream suppliers for all firms in a market. The analysis in Dafny et al. (2012) estimates the market-wide effects of concentration induced by the Aetna-Prudential merger on product market pricing and payments to the upstream market for doctors and nurses. Lucarelli et al. (2012) estimate a structural discrete choice model of the Part D market under Bertrand pricing and simulates the effect on premiums from the 2006 merger of United Healthcare and Pacificare. They find

an average premium increase of 4.7% for the plans of the merged firms, and just 0.9% for all other plans. Our DD results measure the merger effect on a treated plan over and above the equilibrium effects of mergers on the untreated group of plans in the market. For example, if outcomes match that in the simulated model in Lucarelli et al. (2012), the DD estimator on premium would show a $(4.7-0.9)=3.8\%$ increase in premiums. When there are multiple merger events occurring at the same time, the estimator measures the average effect of a merger, not the total effect of all simultaneously occurring mergers. Market-year fixed effects control for the effect that merger intensity has on market prices for all firms in a given year and market. For example, there was a lot of merger activity in 2008 when prices increased by a very large amount of \$6 on average. The fixed effects for 2008 market-years would be higher than other years.

The last consideration for the DD estimator is sample selection. In Part D, plans are allowed to freely enter and exit the market. The DD estimator requires observation of a plan across two consecutive years. As such, new and terminated plans must be dropped from the sample. The DD estimate is potentially biased by sample selection if factors that influence decisions to terminate or introduce a new plan are also related to merger decisions. The issue of plans selecting to enter into or exit out of the market is analogous to the issue of program participation decisions in the typical DD estimator used for household studies. In our case, selection is not a major concern because there is very little churn in plans entering and exiting the market, and the little churn that exists does not appear to be related to merger decisions.⁶ In particular, plans of merged firms are not more or less likely to introduce new plans or terminate plans than non-merging firms (see table 4). There are good reasons to expect little churn in Part D. First, lock-in effects stemming from switching costs give strong incentives for plans to renew plans from year-to-year and make it difficult for new plans to attract enrollees (Miller and Yeo, 2015b; Ericson, 2014). Second, subsidy amounts are calculated based on the previous year's enrollment figures which discourages plan entry and exit (Miller and Yeo, 2015a). For these reasons new insurers that want to enter the Part D market do so by acquiring the plans of incumbent insurers, not by organically creating new plans. The leading example is the 2012 acquisition of Medco by Express Scripts.

In light of all of the possible endogeneity, selection, and equilibrium effects, our empirical application should not be thought of as duplicating a scenario in which mergers are randomly assigned to plan sponsors. Mergers are by definition the result of strategic business decisions, not a policy experiment. Our goal is to control for confounding factors that are not paramount to economic theories of mergers. In principle, a policy intervention could mimic

⁶The exceptions where a lot of entry is observed are 2006, when all plans were new plans by definition, and 2007 when the market was still in its nascency.

an experiment if anti-trust authorities were to block a proposed merger or force a divestiture, but neither has happened for these merger deals.

5.2 Merger Treatment Effects in Overlapping Markets

Mergers involve two parties agreeing to the deal which raises additional issues about not just “when” and “if”, but also “with whom” to merge. Part of our interest is to determine which types of mergers generate more or less market power and cost-side benefits. To explore these margins, we consider market-overlap as a specific “match” characteristic of the merger deals. One of the first order concerns in the horizontal merger guidelines is to determine whether the merger deal involves firms competing “head-to-head.”⁷ The M&A deals in Part D involve large national insurers offering plans in several geographic markets, but not necessarily all markets. There are some markets in which merging firms overlap and others in which only one of the merging firms operates. In the data, 74% of all plans affected by a merger are in markets in which both merging parties compete. Geographic variation allows us to pinpoint market power effects and separate out cost-side effect. Ashenfelter et al. (2015) apply a similar approach in the brewing industry. Oligopoly models of pricing predict mergers to increase market power in markets where merging parties compete head-to-head, but no effect in markets where they do not overlap. The Part D rules guarantee there are no market power effects that spill over across markets. Insurers set separate prices across markets even if the insurance products are otherwise quite similar. Enrollees are strictly prohibited from shopping for plans across markets. Given these rules on market boundaries, merger effects on premiums for plans in isolated markets must be due to some national effect. We modify the treatment variable by including the term $D_{it-1}^{overlap} = 1$ when the other merging party offers at least one plan in year $t - 1$ in the same market as plan i ,⁸

$$p_{it} - p_{it-1} = \alpha + \beta D_{it-1} + \beta D_{it-1}^{overlap} + (\mathbf{X}_{it} - \mathbf{X}_{it-1})' \beta + \mathbf{Z}'_{it-1} \beta + \varphi_{market \times year} + \varphi_{insurer} + \epsilon_{it-1}. \quad (2)$$

We also apply this specification to the drug coverage outcomes. In the bargaining game with drug suppliers the market definitions are not as clear cut as in the premium setting game because national insurers negotiate with national drug suppliers. The local versus national distinction identifies the extent to which local market bargaining with pharmacy outlets and

⁷2010 Horizontal Merger Guidelines section 2.1.4.

⁸We carefully consider exactly which Part D assets are involved in the merger to properly code the merger treatment variable and overlap/non-overlap markets in cases in which the merger involves regional assets. For example, we do not include all plans under the umbrella of Universal American as being affected by the acquisition of the regional insurer Carolina Care Plans Inc., only those in the Carolinas.

regional wholesalers affects drug coverage as compared to national market bargaining with drug manufacturers and pharmacy chains.

5.3 Plan Consolidation Treatment Effects

The next set of DD specifications includes plan consolidation, C_{it-1} , as a treatment effect. In contrast to a merger that is a combination of two distinct insurance companies offering Part D plans into a joint company, plan consolidation is a combination of two or more plans offered by an insurance company into a single plan for the upcoming year. In this sense, our classification of a merger event can be thought of as an *inter*-firm combination, and plan consolidation is an *intra*-firm combination. Note that a non-merging insurer can consolidate its own plans. In periods when an insurer merges it can consolidate its own plans or consolidate with plans offered by its merger partner. Insurers cannot consolidate plans with a rival. We are interested in the distinction between mergers and plan consolidation to test whether market power or cost-side effects can be achieved organically through consolidation.

We specify the following DD estimator for consolidation:

$$p_{it} - p_{it-1} = \alpha + \beta_1 C_{it-1} + (\mathbf{X}_{it} - \mathbf{X}_{it-1})' \beta + \mathbf{Z}'_{it-1} \beta + \varphi_{market \times year} + \varphi_{insurer} + \epsilon_{it-1}. \quad (3)$$

The treatment dummy for plan consolidation $C_{it-1} = 1$ if plan i is consolidated with another plan between years $t - 1$ and t . The same identification issues discussed above for mergers apply for plan consolidation treatment effects. Assuming strict exogeneity for consolidation is perhaps more tenuous than for mergers because the decisions are made at the local plan level as opposed to the national level for merger events. Very specific idiosyncratic factors may trigger plan consolidation that might otherwise have negligible effect on a merger decision. A major concern is that insurers consolidate under-performing plans as a way to remove them from the market. The pre-treatment control variables are particularly important in controlling for any tendencies of insurers to consolidate plans based on market performance. Our robustness checks focus on further concerns.

Finally, we examine the interaction effect of mergers and consolidation to test whether there are greater cost synergies or bargaining gains when merging firms consolidate plans. Merging insurers consolidate about 20% of their plans in overlapping markets, which is quite similar to the frequency of consolidating by non-merging firms (see table 4). We modify the DD specification to include merging treatments (D_{it-1} and $D_{it-1}^{overlap}$), consolidation (C_{it-1}), and the interaction of merging and consolidating plans in overlapping markets ($C_{it-1}*$

$D_{it-1}^{overlap}$):⁹

$$\begin{aligned}
 p_{it} - p_{it-1} = & \alpha + \beta_1 C_{it-1} + \beta_2 D_{it-1} + \beta_3 D_{it-1}^{overlap} + \beta_4 C_{it-1} * D_{it-1}^{overlap} \\
 & + (\mathbf{X}_{it} - \mathbf{X}_{it-1})' \beta + \mathbf{Z}'_{it-1} \beta + \varphi_{market \times year} + \varphi_{insurer} + \epsilon_{it-1}.
 \end{aligned} \tag{4}$$

Whether merging firms consolidate or not can be thought of as a more refined “match” characteristic of the merger deal, allowing us to draw conclusions about the merits of merger deals that involve plan consolidation.

5.4 Robustness: Adverse Selection and Low Income Subsidy Design

For additional robustness, we consider a more in-depth investigation of two institutional features of Part D that have been linked to plan consolidation: adverse selection and strategic gaming of the LIS subsidy design. Part D institutes a risk adjustment mechanism that is intended to mitigate adverse selection (Glazer and McGuire, 2000). Under risk adjustments, plans that attract a high cost pool of enrollees receive transfer payments to compensate for higher costs, while plans that attract a low cost pool have payments deducted. With a well-functioning risk adjustment mechanism, an insurer should be indifferent about the composition of its risk pool and price as if it enrolled an average risk pool. However, the market is susceptible to adverse selection because plans do not receive risk adjustment payments for the component of coverage attributable to enhanced coverage benefits. Micro-data evidence shows enhanced plans are more likely to attract high risk pools (Polyakova, 2015). The failure to fully risk adjust these plans may be leading to an adverse selection unraveling spiral in which the most generous enhanced plans are being dropped from the insurers’ menu of plan offerings. Insurers can drop enhanced plans in three ways: renewing the plan and changing its status to basic coverage, consolidating it with a basic plan, and termination. Over two thirds is by consolidation with basic plans.¹⁰ This occurs frequently; about 25% of all plan consolidation events involve enhanced plans being consolidated with basic plans.

Given so many conversions occur through consolidation, the consolidation treatment effect may not capture intrinsic cost effects due to cost efficiencies or bargaining power. The effect could instead be an artifact of adverse selection. We control for the adverse selection phenomenon in all of our specifications by including first differences of plan status (ba-

⁹We use $C_{it-1} * D_{it-1}^{overlap}$ (consolidation in overlap markets) to measure the interaction effect and exclude $C_{it-1} * D_{it-1}$ because in the latter there can be no consolidation of merging firm’s assets when they operate in separate markets. Moreover, there are only a small number of consolidated plans for just two of the merger deals that occur in non-overlapping markets.

¹⁰22% termination, 10% renewal as basic.

sic/enhanced) and coverage measures that distinguish basic and enhanced plans (deductible and gap coverage) in $(\mathbf{X}_{it} - \mathbf{X}_{it-1})$ and extensive pre-treatment measures of coverage generosity in \mathbf{Z}_{it} . However, there may be unobservable differences in enrollee risk selection not captured by these controls. To directly assess whether the conversion of enhanced plans to basic plans reflects adverse selection, we estimate a specification that considers a treatment effect for enhanced plans converting to basic coverage status; $EtoB_{it-1} = 1$ if an enhanced plan in year $t-1$ converts to a basic plan in year t through either renewal or consolidation. We include the interaction of enhanced to basic conversion with consolidation $EtoB_{it-1} * C_{it-1}$ as a “match” characteristic of consolidation to separate risk selection effects from cost efficiency effects:

$$\begin{aligned}
 p_{it} - p_{it-1} = & \alpha + \beta_1 C_{it-1} + \beta_2 EtoB_{it-1} + \beta_3 EtoB_{it-1} * C_{it-1} \\
 & + (\mathbf{X}_{it} - \mathbf{X}_{it-1})' \beta + \mathbf{Z}'_{it-1} \beta + \varphi_{market \times year} + \varphi_{insurer} + \epsilon_{it-1}.
 \end{aligned} \tag{5}$$

Our next robustness exercise explores the relationship between plan consolidation and strategic gaming of the LIS subsidy design. The special rules to determine subsidy amounts and default plan assignments for LIS beneficiaries distort market outcomes in quite complicated ways, some of which we are able to control for using a plan’s LIS benchmark status and prior year LIS enrollment.¹¹ Decarolis (2015) shows how multi-plan insurers can use plan consolidation as a tool to game the LIS subsidy design to raise premiums. Indeed, the LIS program appears to be a major driver of plan consolidation. The market-wide average frequency of consolidation is 22%; For plans that change their LIS status, the frequency rises to 29%. To test whether strategic consolidation raises premiums, we interact the consolidation treatment with a variable $LISInsurer_{it-1}$ that indicates whether the insurer offers an LIS eligible benchmark plan in the same region as plan i . The intuition behind this test hinges on the weighting scheme that is used to calculate the LIS subsidy amount and threshold. LIS insurers carry a large weight in the calculation and thus possess market power to manipulate the threshold and subsidy level. As described in Decarolis (2015), consolidation can be used as a tool by LIS insurers to raise premiums and subsidy amounts while retaining LIS benchmark status. Similar gaming tactics could be occurring with mergers. To test whether

¹¹The default plan assignment rule creates a demand discontinuity at the LIS benchmark threshold inducing a bunching of prices at the threshold and a pricing gap above the threshold (Miller, 2015). Cost changes have no effect on pricing for insurers with sufficiently low cost; they continue to bunch at the threshold even if cost rises. For higher cost insurers on the margin of bunching, small changes in underlying cost result in large swings in pricing because of the pricing gap. The LIS status variable measured in first differences controls for the pricing gap. A plan’s prior year LIS enrollment affects pricing decisions because the benchmark level is calculated as an average of market premiums weighted by prior year LIS enrollment.

mergers between LIS insurers generate more or less market power, we interact the merger treatment with a variable $LISmerger_{it-1}$ that indicates whether both insurers in a merger offer an LIS eligible benchmark plan in the same region as plan i .

6 Results

In this section we report results of the differences-in-differences estimates for premiums and drug coverage. We consider four dimensions of coverage: the number of drugs on a formulary and usage restrictions as measures of drug access and pricing tiers and the out-of-pocket cost for a basket of the top 100 drugs as measures of drug pricing. The latter is a more refined measure that makes use of drug transaction price data. We report coverage effects for the top 100 drugs in the body of the text and for all NDCs in the appendix. The conclusions are similar. Only the treatment effects are reported in the text; complete regression results that include control variable estimates are reported in the appendix.

6.1 Merger Results: Premiums

Table 6 reports merger effect results. The results in column (1) show the average effect of mergers on plans. Premiums rise \$2.31 relative to the premiums of plans offered in the same market by insurers that do not merge. The rise corresponds to a 5% increase based on an average premium of \$45 across years. The result indicates market power effects dominate cost efficiency and bargaining power effects that might also be pushing down premiums. The estimated rise is larger, \$2.91, in the specification with insurer fixed effects, indicating that mergers occur amongst insurance companies that have the most market power to gain from merging.

The results in column (2) distinguish merger effects in non-overlapping markets in which only one of the merging parties operates and overlapping markets in which both merging firms operate. The premium slightly decreases by \$0.69 in non-overlapping markets and is statistically indistinguishable from zero. Premiums increase significantly in overlapping markets, \$3.97 higher than merger affected plans in non-overlapping markets, $(3.97-0.69)=\$3.28$ higher than plans of non-merging insurers. The results with insurer fixed effects are similar. The large price increase in overlapping markets shows that market power overwhelmingly dominates any local or national cost efficiency or bargaining gains. The non-overlapping market case isolates national level cost efficiency/bargaining gains from market power because the merger does not induce any change in market structure. Mergers may stimulate some cost improvements, but the effect is small.

6.2 Merger Results: Coverage

The next set of results shows the effect of mergers on drug access and drug pricing. Mergers bring about meaningful gains in access that appear at the national level. Both measures of drug access —formulary comprehensiveness and usage restrictions —improve in non-overlapping merger markets relative to plans unaffected by a merger. The coefficient on the merger dummy indicates plans of merged insurers add 1.1 of the top 100 drugs. Given that the average plan covers 90 of the top 100 drugs, the change represents an increase in percentage terms of 1.2%. The figure may seem small, but, stated equivalently, 1.1 additional listed drugs corresponds to an 11% decrease in the number of top 100 excluded from formularies. Usage restrictions relax, decreasing by 0.027, a change of 9.6% relative to an average of 0.280 restrictions per drug.

Access improvements disappear in overlapping markets. There are no gains in formulary comprehensiveness relative to non-merger plans and usage restrictions become more stringent. These results suggest that local market power not only raises premiums, but also negates the drug access benefits of mergers.

We next consider the effect of mergers on drug pricing. The outcome of interest is the monthly out-of-pocket cost in copays/coinsurance that an enrollee pays for a basket of top 100 drugs in the initial coverage zone. This is the most encompassing measure of coverage. Three components influence out-of-pocket costs: the number of drugs out of top 100 list covered by a plan's formulary, copay and coinsurance rates, and the transaction price for each drug negotiated with drug suppliers. The drug price index rises by \$1.79 in non-overlapping markets, which corresponds to a 2.8% increase based on an average index value of \$63. That increase is almost completely offset in overlapping markets. These results contrast with those for drug access. In non-overlapping markets, drug access improves but cost rises. In overlapping markets, access deteriorates but cost declines. These coverage results for the top 100 drugs are robust to the inclusion of insurer fixed effects, increasing somewhat in magnitude.

The divergent results for pricing and access shed light on the way mergers impact the bargaining process. Bargaining between insurers and drug manufacturers at the national level heavily determines formulary inclusion and usage restrictions, while bargaining at the local level with pharmacies and wholesalers determines pricing. The access improvements in non-overlap markets serves as evidence of national level effects. Merging firms, that increase their national level enrollment, gain more bargaining power which they use to cover more drugs with fewer restrictions. Those national level bargaining gains do not extend to drug pricing. In overlap markets, merging firms gain greater local enrollment which gives them added monopsony power to demand price concessions from pharmacies and wholesalers.

They also exercise local market power over consumers by cutting access, which may further improve bargaining over pricing. In non-overlap merger markets there is no change in market structure, and hence no change in the local bargaining position. As a result, the merged insurer, with a broader formulary, cannot negotiate drug prices as low as it could absent the merger with a more restricted formulary.

The results for all NDCs on the formulary (reported in table 10 in the appendix) are quantitatively similar in relative magnitude to those for the top 100 drugs. Merging firms add drugs to the formulary and ease restrictions in non-overlapping markets; they subtract and stiffen in overlapping markets. In lieu of the copay price index, we infer drug price effects using the copay pricing tier variable. Tiers do not change in non-overlapping markets and decrease in overlapping markets.

6.3 Plan Consolidation Results

Table 7 reports results for plan consolidation. The most striking result is the very large decrease in premiums. Premiums of consolidated plans decline \$4.34 on average, or 9.6%. The magnitude is larger than any effect found for mergers. But, the decrease only occurs for non-merging insurers. Premiums rise for the consolidated plans of merged insurers. This is evidence that internal plan consolidation, not mergers, bring about significant cost-side improvements.

The cost improvements are not accompanied by coverage gains. Coverage diminishes for consolidated plans of non-merging insurers both in terms of formulary comprehensiveness and drug pricing. However, coverage effects attenuate in the specification with insurer fixed effects. This suggests that the reduced coverage is not necessarily caused by consolidation, but rather some other characteristics of insurers engaging in consolidation. The strong effect on premiums and weak effect on coverage also suggests the cost benefits of plan consolidation can be attributed to marketing or administrative cost efficiencies, not bargaining. If bargaining were to explain the cost reduction, the results would likely show an accompanying effect on coverage.

The results differ markedly for consolidated plans of merging insurers. Premiums increase modestly. Drug coverage improves dramatically. The sum of the treatment effect interactions shows that premiums increase \$1.60 relative to the control group of renewed plans not affected by a merger. Market power dominates but is not that severe. For comparison, market power is stronger amongst the non-consolidated plans of merged insurers in overlapping markets; premiums increase \$2.72. The premium results are robust to the inclusion of insurer fixed effects.

Coverage in terms of access and price improves dramatically for consolidated plans of merging insurers. Relative to the control group of renewed plans by non-merging insurers, top 100 formulary counts increase by 5.3 (equivalent to a 53% reduction in the number of excluded drugs), the out-of-pocket price index falls \$6.30 (10% drop), and restrictions ease by 0.024 (8.6%). The only coverage dimension that does not improve is the pricing tier, remaining near unchanged (increase 0.002). From this we can infer that the lower out-of-price index is not due to lower copay/coinsurance rates, but rather a combination of greater formulary comprehensive and lower negotiated drug prices. The results are robust to the inclusion of insurer fixed effects, providing further credence to the claim that any insurer engaged in merging and consolidating can achieve lower premiums/increased coverage, not just the specific insurers that did so in our sample. All of the results discussed in reference to table 6 about merging and market overlap hold for renewed plans in the specification with consolidation treatments. However, the market power effects of mergers driving up premiums and eroding coverage are larger in magnitude for overlapping markets. Coverage results for consolidation are similar for all NDCs on the formulary.

6.4 Results Discussion: Decomposing Merger Effects

The full body of results allows us to decompose market power, cost efficiency, and bargaining power effects. Market power is clearly the strongest in mergers in which there is significant market overlap and the firms do not engage in any restructuring to consolidate their plans; that is they simply renew the plans they previously offered before the merger. Premiums rise and any gains in drug access that the merger generates are eroded. However, they gain some bargaining power over drug acquisition prices that partially offsets the negatives effects on consumers from reduced drug access. Market power effects are weak in mergers with no market overlap. There are some gains in cost efficiencies and bargaining power resulting in slightly lower premiums and appreciably better drug access. The bargaining gains do not translate into reduced drug prices. Prices rise. A comparison of drug coverage results based on market overlap reveals how the bargaining process works in Part D. National level bargaining power matters for drug access, while market level bargaining matters for drug pricing.

The most significant change occurs in mergers in which the insurers consolidate their plans. Market power dominates the effect on premiums, but to a lesser degree. Cost efficiency and bargaining power gains blunt the premium rise and generate significant coverage improvements in terms of drug access and pricing. These results show that it takes a restructuring of the combined firm through plan consolidation to fully realize the beneficial aspects

of mergers. This conclusion raises the question of whether a firm can organically realize the cost efficiency and bargaining benefits of consolidating plans without engaging in a merger. They cannot achieve across-the-board bargaining gains over drug coverage. Although, there is some evidence of a shift in coverage towards greater access at higher prices. They can significantly reduce their cost which translates into lower premiums. A comparison of the results on merging and consolidating shows that market power and bargaining power are the key forces in mergers, while cost efficiencies are primarily driven by consolidation.

6.5 Robustness Results

In this section we explore the robustness of our results. We primarily seek support for our results about plan consolidation, which showed a large drop in premiums. We attribute this finding to marketing and administrative cost efficiencies, an interpretation grounded in the prior literature about insurance loads. However, there is less background to guide this interpretation than there is for our merger results that can be informed by longstanding economic theories and practical guidelines for anti-trust enforcement. Moreover, the high rate of consolidation (in more general terms product market restructuring) is somewhat unique to Part D and receives a lot of attention by regulators.

Studies on the Part D market (Polyakova, 2015; Decarolis, 2015; Miller, 2015) suggest alternative mechanisms related to adverse selection and gaming of the LIS subsidy design that could explain the effects of consolidation on premiums. Full discussions of the institutional details, theory, and econometric approach are described in the methodology section. To briefly recap, the large drop in premiums found for consolidation could be the result of adversely selected enrollees in enhanced plans being consolidated into basic plans. Plan consolidation can be used as a tool to game the LIS subsidy design, in which case our consolidation results could reflect LIS benchmark insurers' market power over the subsidy.

Table 8 reports results. Premiums decrease by a lot for enhanced plans converted to basic status, particularly when the conversion is carried out through consolidation. Premiums decrease \$12.77 relative to other consolidated plans. The coefficient on the consolidation treatment (-\$2.83) is not as large as that found in our main specifications, but in the greater context remains large and negative. This robustness check shows that about half of the premium decrease can be attributed to adverse selection and the other half to cost efficiency factors. Note that the robustness check conditions on coverage features that distinguish basic and enhanced plans, so the drop in premiums for enhanced-to-basic conversions is not simply due to higher deductibles or reduced coverage in the gap lowering the insurer's actuarial liability. The results about LIS gaming show that the premiums of the consolidated

plans of LIS insurers rises \$2.14 relative to the premiums of non-LIS insurers' consolidated plans. This confirms the results in Decarolis (2015) about plan consolidation being used to raise premiums. The insurer fixed effects absorb much of the effect, suggesting only specific firms have engaged in the gaming. The coefficient on the consolidation dummy remains large and negative, indicating consolidation lowers cost independent of LIS gaming incentives. The final robustness specification considers mergers between two LIS insurers. Our motivation for this test is that some of the complicated market power incentives related to consolidation and the LIS program could extend to mergers. We find that mergers of LIS firms have lower premium increases than mergers of non-LIS firms.

7 Conclusion

This paper examines the effects of horizontal mergers amongst Part D insurers on premiums and coverage characteristics with the aim of decomposing the three channels through which mergers affect markets: market power, cost efficiencies, and bargaining power. Our method applies a differences-in-differences identification strategy to a large panel of all Part D plans sold between 2006 and 2012. We distinguish market power and cost-side effects by isolating markets in which both firms overlap, competing head-to-head, from those in which only one firm operates. We make use of detailed formulary and drug pricing data to provide richer insights about how mergers affect the bargaining process than can be gleaned from results on premiums. We also make a distinction between mergers —inter-firm combinations —and plan consolidation —intra-firm combinations —to test whether the purported merger benefits can be achieved organically without merging and whether synergies exist for merging insurers that restructure their plan offerings through consolidation.

We draw four main conclusions. First, merger deals that involve significant market overlap create considerable market power, negatively impacting premiums and, to some extent, drug access. However, these deals generate monopsony power at the local level that enables the merged firm to negotiate lower drug prices. Second, market power effects vanish in mergers with little market overlap, but there is little evidence of cost efficiency improvements. Drug access improves, a sign of increased bargaining power at the national level with drug manufacturers, but drug prices rise, a sign of weakened local level monopsony power.

Our other main conclusions regard plan consolidation, which is occurring at a high rate and being promoted by regulators. Plan consolidation enables merging firms to maximize bargaining power; coverage improves significantly in terms of both drug access and pricing. Premiums rise, but the market power effect is less dominant than in mergers in which the

firms simply renew their existing plans. Our final conclusion shows that plan consolidation, even absent a merger, stimulates large cost reductions that translate to lower premiums. We attribute the decline to improved cost efficiencies, although some of the cost improvements are an artifact of reduced adverse selection. Coverage is not impacted by consolidation if not accompanied by a merger.

Given the rapid pace of M&A activity in the industry, there is keen interest amongst anti-trust authorities and healthcare policy makers to scrutinize these deals. Our conclusions have important ramifications. Anti-trust authorities should direct the focus of their investigations on market power and bargaining power effects. There are tradeoffs. Judgements ultimately rest on a balance of outcome preferences over premiums, drug access, and drug pricing. How these three outcomes are affected crucially depends on specific merger deal characteristics including market overlap and whether the merger parties integrate their business activities through plan consolidation. Cost efficiencies are less relevant because plan consolidation, not mergers, generate cost efficiency gains that can be achieved without merging. These findings inform the policy debate about eliminating plans to reduce the burdens of choice. On-going efforts to restrict choices by encouraging consolidation should be favored over the alternative of adopting a lenient stance on mergers.

The wave of mergers occurring in the health insurance industry has a broader impact outside Part D. Many of the conclusions of this study could extend to related markets (employer sponsored, Medicare Advantage, ACA exchanges). There may be important differences with regards to bargaining because negotiations between insurers and hospitals/physicians occur at a more local level than in Part D where drugs are sold nationally. The Part D market is also experiencing a wave of vertical mergers with retail pharmacies, such as the CVS-Caremark deal, and with pharmacy benefits managers (PBMs) such as the UnitedHealth-Catamaran deal. As we find for horizontal mergers, vertical integration could have profound effects on the bargaining process. We leave these other merger studies to future work.

References

- J. Abaluck and J. Gruber. Choice Inconsistencies Among the Elderly: Evidence from Plan Choice in the Medicare Part D Program. *American Economic Review*, 101(4):1180–1210, 2011.
- J. Allen, R. Clark, and J. Houde. The Effect of Mergers in Search Markets: Evidence from the Canadian Mortgage Industry. *American Economic Review*, 104(10):3365–96, 2014.
- J. Angrist and J. Pischke. The Credibility Revolution in Empirical Economics: How Better Research Design is Taking the Con out of Econometrics. *The Journal of Economic Perspectives*, 24(2):3–30, 2010.

- O. Ashenfelter, D. Hosken, and M. Weinberg. Efficiencies Brewed: Pricing and Consolidation in the US Beer Industry. *The RAND Journal of Economics*, 46(2):328–361, 2015.
- L. Bates, J. Hilliard, and R. Santerre. Do Health Insurers Possess Market Power? *Southern Economic Journal*, 78(4):1289–1304, 2012.
- M. Bertrand, E. Duflo, and S. Mullainathan. How Much Should We Trust Differences-in-Differences Estimates? *Quarterly Journal of Economics*, 119(1):249–275, 2004.
- J. Brown, M. Duggan, I. Kuziemko, and W. Woolston. How Does Risk Selection Respond to Risk Adjustment? Evidence from the Medicare Advantage Program. *American Economic Review*, 104(10):3335–3364, 2014.
- C. Carey. Government Payments and Insurer Benefit Design in Medicare Part D. *Michigan working paper*, 2014.
- L. Dafny. Are Health Insurance Markets Competitive? *American Economic Review*, 100(4):1399–1431, 2010.
- L. Dafny, M. Duggan, and S. Ramanarayanan. Paying a Premium on Your Premium? Consolidation in the US Health Insurance Industry. *American Economic Review*, 102(2):1161–85, 2012.
- F Decarolis. Medicare Part D: Are Insurers Gaming the Low Income Subsidy Design. *American Economic Review*, 105(4):1547–1580, 2015.
- M. Duggan and F. Scott-Morton. The Effect of Medicare Part D on Pharmaceutical Prices and Utilization. *The American Economic Review*, 100(1):590–607, 2010.
- M. Duggan and F. Scott-Morton. The Medium-term Impact of Medicare Part D on Pharmaceutical Prices. *The American Economic Review*, pages 387–392, 2011.
- R. Ellis. Five Questions for Health Economists. *International Journal of Health Care Finance and Economics*, pages 1–17, 2012.
- K. Ericson. Consumer Inertia and Firm Pricing in the Medicare Part D Prescription Drug Insurance Exchange. *American Economic Journal: Economic Policy*, 6(1):38–64, 2014.
- C. Fee and S. Thomas. Sources of gains in horizontal mergers: evidence from customer, supplier, and rival firms. *Journal of Financial Economics*, 74(3):423–460, 2004.
- R. Frank and J. Newhouse. Should drug prices be negotiated under Part D of Medicare? And if so, how? *Health Affairs*, 27(1):33–43, 2008.
- J. Glazer and T. McGuire. Optimal Risk Adjustment in Markets with Adverse Selection: an Application to Managed Care. *The American Economic Review*, 90(4):1055–1071, 2000.
- G. Gowrisankaran, A. Nevo, and R. Town. Mergers When Prices are Negotiated: Evidence from the Hospital Industry. *American Economic Review*, 105(1):172–203, 2015.
- J. Hastings. Vertical Relationships and Competition in Retail Gasoline Markets: Empirical Evidence from Contract Changes in Southern California. *American Economic Review*, 94(1):317–328, 2004.
- F. Heiss, A. Leive, D. McFadden, and J. Winter. Plan selection in Medicare Part D: Evidence from administrative data. *Journal of Health Economics*, 32(6):1325–1344, 2013.
- K. Ho. Insurer-provider Networks in the Medical Care Market. *The American Economic Review*, 99(1):393–430, 2009.
- K. Ho and R. Lee. Insurer Competition in Health Care Markets. *National Bureau of Eco-*

- conomic Research*, 2015.
- P. Karaca-Mandic, J. Abraham, and C. Phelps. How Do Health Insurance Loading Fees Vary by Group Size?: Implications for Healthcare Reform. *International Journal of Health Care Finance and Economics*, 11(3):181–207, 2011.
- J. Ketcham, C. Lucarelli, E. Miravete, and M. Roebuck. Sinking, Swimming, or Learning to Swim in Medicare Part D. *The American Economic Review*, 102(6):2639–2673, 2012.
- J. Kling, S. Mullainathan, E. Shafir, L. Vermeulen, and M. Wrobel. Comparison Friction: Experimental Evidence From Medicare Drug Plans. *Quarterly Journal of Economics*, 127(1):199–235, 2012.
- M. Lewis and K. Pflum. Diagnosing hospital system bargaining power in managed care networks. *American Economic Journal: Economic Policy*, 7(1):243–274, 2015a.
- M. Lewis and K. Pflum. Hospital Systems and Bargaining Power: Evidence from Out-Of-Market Acquisitions. *Clemson University working paper*, 2015b.
- C. Lucarelli, J. Prince, and K. Simon. The Welfare Impact of Reducing Choice in Medicare Part D: A Comparison of Two Regulation Strategies. *International Economic Review*, 53(4):1155–1177, 2012.
- V. Maksimovic, G. Phillips, and N. Prabhala. Post-merger Restructuring and the Boundaries of the Firm. *Journal of Financial Economics*, 102(2):317–343, 2011.
- D. Miller. Risk Adjustment and Low Income Subsidy Distortions in Medicare Part D. *Working Paper Clemson University*, 2015.
- D. Miller and J. Yeo. The Consequences of a Public Health Insurance Option: Evidence from Medicare Part D. *Working Paper Clemson University, Singapore Management University*, 2015a.
- D. Miller and J. Yeo. Discrete Choice Models to Estimate Switching Costs: An Application to Medicare Part D. *Working Paper Clemson University, Singapore Management University*, 2015b.
- M. Park and R. Town. Industry Shock Expectations, Interindustry Linkages, and Merger Waves: Evidence from the Hospital Industry. *Journal of Economics and Management Strategy*, 23(3):548–567, 2014.
- M. Polyakova. Regulation of Insurance with Adverse Selection and Switching Costs: Evidence from Medicare Part D. *Stanford working paper*, 2015.
- A. Starc. Insurer Pricing and Consumer Welfare: Evidence from Medigap. *The RAND Journal of Economics*, 45(1):198–220, 2014.

A Tables

Table 3: Part D Plan-level Summary Statistics, 2006-2012

	2006	2007	2008	2009	2010	2011	2012
Premium	37.36 (12.82)	36.68 (15.08)	39.86 (19.89)	45.64 (20.67)	46.53 (19.71)	53.77 (25.38)	53.41 (26.72)
Deductible	92.51 (115.84)	93.68 (5.90)	104.56 (128.88)	111.70 (137.00)	139.95 (135.80)	153.06 (142.00)	153.40 (152.51)
Drug Access							
Formulary:							
all NDCs*	14,688 (13,682)	4,989 (1,500)	4,199 (1,080)	4,031 (970)	3,397 (668)	3,343 (604)	3,441 (585)
top 100 drugs	91.58 (5.92)	93.66 (121.84)	90.76 (7.70)	88.04 (9.15)	83.11 (7.19)	77.78 (7.03)	74.52 (7.38)
Restrictions:							
unconditional (0-3), all	0.16 (0.19)	0.19 (0.08)	0.27 (0.13)	0.31 (0.13)	0.33 (0.12)	0.32 (0.11)	0.36 (0.13)
unconditional (0-3), top	0.17 (0.19)	0.23 (0.14)	0.28 (0.17)	0.30 (0.15)	0.29 (0.13)	0.26 (0.11)	0.28 (0.12)
conditional (1-3), all	1.07 (0.05)	1.12 (0.07)	1.14 (0.08)	1.15 (0.08)	1.16 (0.10)	1.14 (0.08)	1.14 (0.08)
conditional (1-3), top	1.07 (0.10)	1.14 (0.13)	1.16 (0.14)	1.12 (0.10)	1.12 (0.12)	1.11 (0.12)	1.08 (0.08)
Drug Pricing							
Price index	45.12 (12.38)	45.51 (12.08)	51.89 (13.07)	57.79 (10.79)	70.99 (9.72)	77.36 (9.32)	87.48 (13.06)
Tier:							
all drugs	0.22 (0.13)	0.28 (0.08)	0.31 (0.08)	0.32 (0.10)	0.30 (0.08)	0.33 (0.10)	0.37 (0.10)
top 100	0.20 (0.14)	0.26 (0.09)	0.26 (0.09)	0.27 (0.12)	0.22 (0.09)	0.23 (0.09)	0.25 (0.10)
Plans with gap coverage	0.31	0.29	0.29	0.26	0.20	0.35	0.24
Basic plans	0.58	0.52	0.49	0.46	0.49	0.57	0.52
Benchmark plans	0.28	0.34	0.26	0.17	0.19	0.29	0.30
% renewed	82.64	80.14	84.42	78.49	46.28	75.53	
% consolidated	17.15	15.20	10.69	20.53	46.87	21.28	
% terminated	0.21	4.66	4.90	0.98	6.85	2.90	
% new plans	100.00	32.49	3.32	6.64	1.51	10.06	10.45
N plans offered	1,446	1,908	1,778	1,627	1,519	1,034	995

Notes: The unit of observation is a plan. All stand-alone Part D plans that are offered in a current year are included. Gap coverage and deductible standards for Part D plans were altered through 2006-2012 as described in detail in the text. In 2006, requirements on formulary listing of NDCs differ from the requirements in 2007-2012. Plan restrictions are summarized for all plans and, separately, conditional on any restrictions in place. Out-of-pocket cost of top 100 drugs assigns a 1/100 weight to each drug. The statistics on renewed, consolidated, and terminated represent the transition status for the upcoming year. The new plan statistic represents the percent of plans introduced as new plans for the current year. All dollar values are in nominal terms. Standard deviations are in parentheses.

Table 4: Control and Comparison Groups, 2006-2012

	M&A Plans		non-M&A Plans	
	Before	After	Before	After
Premium	40.27 (16.83)	44.81 (19.51)	42.54 (19.94)	45.16 (22.03)
Deductible	121.46 (139.07)	117.78 (145.21)	112.52 (130.37)	118.14 (135.06)
Drug Access				
Formulary: all NDCs*	3,983 (1,143)	3,847 (960)	4,036 (1,190)	3,712 (900)
top 100 drugs	88.22 (10.54)	86.31 (11.15)	88.06 (8.35)	85.32 (9.49)
Restrictions: unconditional (0-3), all	0.23 (0.15)	0.29 (0.14)	0.27 (0.14)	0.30 (0.13)
unconditional (0-3), top	0.19 (0.14)	0.23 (0.13)	0.27 (0.16)	0.28 (0.14)
conditional (1-3), all	1.11 (0.07)	1.14 (0.06)	1.13 (0.08)	1.15 (0.09)
conditional (1-3), top	1.13 (0.14)	1.10 (0.06)	1.12 (0.12)	1.13 (0.13)
Drug Pricing				
Price index	57.90 (16.65)	63.47 (18.03)	56.71 (15.78)	63.45 (17.59)
Tier: all drugs	0.30 (0.09)	0.32 (0.08)	0.29 (0.10)	0.31 (0.09)
top 100	0.24 (0.13)	0.25 (0.13)	0.24 (0.10)	0.25 (0.09)
Plan market share, %	1.38 (0.024)	1.91 (3.26)	0.76 (1.58)	0.90 (1.67)
Enrollment	15,825 (33,560)	22,940 (47,206)	9,583 (23,577)	11,562 (25,447)
LIS enrollment	8,681 (18,393)	12,167 (25,319)	4,436 (13,244)	5,276 (14,171)
Plans with gap coverage	0.26	0.24	0.27	0.26
Basic plans	0.59	0.53	0.50	0.51
Benchmark plans	0.33	0.33	0.24	0.24
% renewal plans	78.54		77.65	
% consolidated plans	21.46		22.35	
N plans	1,379		7,598	

Notes: Only renewal and consolidated renewal stand-alone Part D plans are included. Since the requirements on formulary listing of NDCs differ from the requirements in 2007-2012, the data on NDC coverage in 2006-2007 are excluded. Out-of-pocket cost of top 100 drugs assigns a 1/100 weight to each drug. All dollar values are in nominal terms. Standard deviations are in parentheses.

Table 5: Comparative Summary Statistics for Non-renewed Plans, 2006-2012

Plan Characteristics	2006-2007		2007-2008		2008-2009		2009-2010		2010-2011		2011-2012	
	ALL	T	ALL	T	ALL	T	ALL	T	ALL	T	ALL	T
Premium	37.36 (12.82)	75.44 (41.65)	36.69 (15.08)	39.81 (8.22)	40.31 (20.02)	55.38 (19.32)	45.81 (20.70)	65.73 (36.78)	46.17 (19.13)	59.21 (20.30)	53.62 (25.27)	49.92 (11.25)
Deductible	92.51 (115.84)	0.00 (0.00)	93.57 (121.81)	113.15 (131.82)	103.73 (128.40)	73.85 (90.05)	110.02 (136.56)	110.63 (147.50)	144.18 (135.57)	49.78 (109.69)	153.50 (141.97)	129.10 (91.29)
Enrollment	10,730 (25,159)	12 (42)	8,469 (23,060)	122 (487)	8,778 (21,056)	310 (750)	9,329 (21,783)	1,514 (3,058)	10,387 (23,700)	3,263 (14,307)	16,154 (37,149)	568 (1,123)
LIS enrollment	5,588 (13,368)	5 (0)	4,194 (13,817)	28 (119)	4,278 (11,493)	143 (636)	4,346 (12,314)	849 (2,632)	4,899 (14,401)	2,438 (13,432)	7,677 (20,314)	355 (1,123)
Market share, in %	0.93 (1.79)	0.0004 (0.0003)	0.71 (1.63)	0.011 (0.035)	0.72 (1.55)	0.032 (0.091)	0.75 (1.50)	0.184 (0.342)	0.81 (1.56)	0.208 (0.435)	1.23 (2.41)	0.056 (0.137)
Basic plans	0.58	0.00	0.52	0.83	0.48	0.10	0.45	0.44	0.51	0.41	0.57	0.94
Benchmark plans	0.28	0.00	0.60	0.16	0.24	0.05	0.17	0.06	0.19	0.00	0.30	0.06
Coverage in gap	0.31	1.00	0.29	0.15	0.30	0.90	0.25	0.38	0.19	0.51	0.35	0.06
N plans	1,446	3	1,908	89	1,778	87	1,627	16	1,519	104	1,037	33

Notes: The table compares plan characteristics of plans terminated at the end of year t to the characteristics of all plans offered in year t . "T" stands for terminated plans. All dollar values are in nominal terms. Standard errors are in parentheses.

Table 6: Merger (inter-firm) Results

	PREMIUM		PLAN COVERAGE							
			TOP 100 DRUG ACCESS				TOP 100 PRICING			
			FORMULARY		RESTRICTIONS		PRICE INDEX		TIERS	
(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	
Panel A: Main specification										
Merger	2.307 ^a	-0.686	0.624 ^a	1.106 ^b	0.013 ^a	-0.027 ^a	0.016	1.729 ^a	-0.013 ^a	-0.017
	(0.321)	(0.470)	(0.229)	(0.514)	(0.004)	(0.006)	(0.271)	(0.388)	(0.005)	(0.011)
Merger in overlapping market		3.969 ^a		-0.639		0.053 ^a		-2.271 ^a		0.005
		(0.505)		(0.633)		(0.009)		(0.551)		(0.013)
Panel B: Insurer FEs										
Merger	2.910 ^a	-0.427	0.410 ^c	1.716 ^a	0.012 ^a	-0.029 ^a	0.777 ^b	1.933 ^a	-0.012 ^b	0.005
	(0.428)	(0.673)	(0.234)	(0.360)	(0.004)	(0.004)	(0.381)	(0.494)	(0.006)	(0.009)
Merger in overlapping market		4.330 ^a		-1.694 ^a		0.054 ^a		-1.500 ^a		-0.022 ^b
		(0.661)		(0.459)		(0.005)		(0.439)		(0.010)
Panel C: No Controls/FEs										
Merger	1.919 ^a	1.179	0.838 ^a	0.871 ^a	0.025 ^a	0.0003	-0.929 ^a	-1.502 ^b	0.010 ^a	-0.012 ^b
	(0.383)	(0.722)	(0.172)	(0.323)	(0.003)	(0.006)	(0.318)	(0.598)	(0.003)	(0.006)
Merger in overlapping market		0.985		-0.043		0.033 ^a		0.764		0.028 ^a
		(0.815)		(0.365)		(0.007)		(0.675)		(0.006)

Notes: This table summarizes the effect of mergers on premiums and coverage for the top 100 drugs. The main specification shown in Panel A includes market-year fixed effects. In addition to that, Panel B includes insurer fixed effects. Both panels include a rich set of plan-level controls. Plan characteristics in first differences include basic/enhanced plan status, LIS benchmark status, deductible, gap coverage. In addition to that, characteristics taken at their pre-merger level include the premium, drug price index, number of drugs covered, restrictions, tiers, log enrollment, market share, log LIS enrollment, LIS market share. Standard errors are clustered by market-year. For comparison purposes, in Panel C we show a specification with no controls or fixed effects. Coefficient estimates that are significant at 1%, 5%, and 10% level are denoted with a, b, and c respectively. Standard errors are in parentheses. The number of observations in Panels A&B is 8,790 and 8,978 in Panel C due to a few missing values in the CMS files; 15% of these plans are affected by a merger and 11% are merger-affected plans offered in overlapping markets.

Table 7: Plan Consolidation (intra-firm) Results

	PREMIUM		PLAN COVERAGE							
			TOP 100 DRUG ACCESS				TOP 100 PRICING			
			FORMULARY		RESTRICTIONS		PRICE INDEX		TIERS	
(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	
Panel A: Main specification										
Plan consolidation	-4.341 ^a (0.379)	-4.855 ^a (0.419)	-0.317 (0.265)	-1.260 ^a (0.237)	-0.011 ^a (0.003)	-0.004 (0.003)	0.635 ^c (0.328)	1.773 ^a (0.368)	-0.021 ^a (0.003)	-0.027 ^a (0.002)
Merger & Plan consolidation in overlapping market		3.721 ^a (0.698)		7.437 ^a (0.810)		-0.058 ^a (0.008)		-9.200 ^a (0.907)		-0.050 ^a (0.010)
Merger		-0.452 (0.493)		1.167 ^b (0.530)		-0.026 ^a (0.006)		1.643 ^a (0.409)		-0.016 (0.011)
Merger in overlapping market		3.179 ^a (0.541)		-2.060 ^a (0.613)		0.064 ^a (0.010)		-0.509 (0.554)		-0.005 (0.013)
Panel B: Insurer FEs										
Plan consolidation	-3.993 ^a (0.326)	-4.487 ^a (0.375)	0.426 ^a (0.157)	-0.238 ^c (0.121)	-0.013 ^a (0.003)	-0.011 ^a (0.003)	-0.973 ^a (0.177)	-0.096 (0.190)	-0.014 ^a (0.003)	-0.019 ^a (0.002)
Merger & Plan consolidation in overlapping market		4.231 ^a (0.719)		5.029 ^a (0.723)		-0.011 (0.009)		-6.358 ^a (0.850)		0.035 ^a (0.010)
Merger		-0.686 (0.714)		1.688 ^a (0.375)		-0.030 ^a (0.004)		1.947 ^a (0.480)		0.004 (0.009)
Merger in overlapping market		3.586 ^a (0.697)		-2.592 ^a (0.424)		0.056 ^a (0.005)		-0.363 (0.448)		-0.029 ^a (0.009)
Panel C: No Controls/FEs										
Plan consolidation	-4.329 ^a (0.330)	-4.360 ^a (0.348)	-0.538 ^a (0.149)	-1.297 ^a (0.155)	-0.023 ^a (0.003)	-0.019 ^a (0.003)	1.083 ^a (0.275)	1.861 ^a (0.290)	-0.006 ^b (0.003)	-0.011 ^a (0.003)
Merger & Plan consolidation in overlapping market		0.497 (1.075)		7.264 ^a (0.479)		-0.030 ^a (0.009)		-7.361 ^a (0.894)		0.055 ^a (0.009)
Merger		1.400 (0.716)		0.931 ^a (0.319)		0.001 (0.006)		-1.589 ^a (0.595)		-0.011 ^c (0.006)
Merger in overlapping market		0.544 (0.837)		-1.566 ^a (0.373)		0.038 ^a (0.007)		2.350 ^a (0.696)		0.017 ^b (0.007)

Notes: This table summarizes the effect of consolidation on plan premium and coverage. Plan coverage characteristics are taken for the top 100 drugs. The preferred specification shown in Panel A includes market-year fixed effects. In addition to that, Panel B includes insurer fixed effects. Both panels include a rich set of plan-level controls. Plan characteristics in first differences are basic/enhanced plan status, deductible, gap coverage. Plan characteristics taken at their pre-merger level are plan premium, drug price index, number of drugs covered, basic/enhanced plan status, enrollment, deductible, gap coverage, LIS status and enrollment, plan market share overall and on the LIS market. Standard errors are clustered by market-year. For comparison purposes, in Panel C we show a baseline specification that is stripped down of controls and fixed effects. Coefficient estimates that are significant at 1%, 5%, and 10% level are denoted with a, b, and c respectively. Standard errors are in parentheses. The number of observations in Panels A&B is 8,790 and 8,978 in Panel C due to a few missing values in the CMS files; 15% of these plans are affected by a merger, 11% are merger-affected plans offered in overlapping markets, 22% are consolidated renewal plans, and 2% are consolidated renewals in overlapping markets.

Table 8: Robustness: Adverse Selection & LIS Gaming

Premium Effects	Mkt-Year FE	Mkt-Year & Insurer FE
Test 1: Adverse Selection		
Plan Consolidation	-2.836 ^a (0.344)	-2.656 ^a (0.304)
Enhanced plan conversion to basic	-7.767 ^a (1.049)	-3.853 ^a (1.260)
Plan consolidation & enhanced plan conversion to basic	-5.002 ^a (0.952)	-6.720 ^a (1.128)
Test 2: Plan Consolidation by LIS Benchmark Insurers		
Plan consolidation	-5.507 ^a (0.500)	-4.367 ^a (0.485)
Plan consolidation by LIS insurer	2.143 ^a (0.652)	0.678 (0.710)
Test 3: Merging of LIS Benchmark Insurers		
Merger	-0.689 (0.470)	-0.396 (0.671)
Merger in overlapping market	4.485 ^a (0.613)	5.494 ^a (0.771)
Merger of LIS insurers in overlapping market	-0.821 ^c (0.494)	-1.924 ^a (0.570)

Notes: This table summarizes the results the three robustness checks related to adverse selection and LIS pricing incentives. All tests include a rich set of plan-level controls. Plan characteristics in first differences include basic/enhanced plan status, LIS benchmark status, deductible, gap coverage. In addition to that, characteristics taken at their pre-merger level include the premium, drug price index, number of drugs covered, restrictions, tiers, log enrollment, market share, log LIS enrollment, LIS market share. Standard errors are clustered by market-year. Coefficient estimates that are significant at 1%, 5%, and 10% level are denoted with a, b, and c respectively. Standard errors are in parentheses.

B Appendix: Complete Output Tables

Table 9: Merger and Consolidation Results: Premium. Complete Output

	(1)		(2)	
	Coef Est	Std Err	Coef Est	Std Err
Merger	-0.686	(0.470)	-0.452	(0.493)
Merger in overlapping market	3.969 ^a	(0.505)	3.179 ^a	(0.541)
Plan consolidation			-4.855 ^a	(0.419)
Merger & Plan consolidation in overlapping market			3.721 ^a	(0.698)
Covariates in first differences				
Benefit type	-2.017 ^a	(0.422)	-0.305	(0.455)
Deductible	-0.022 ^a	(0.002)	-0.026 ^a	(0.002)
Gap coverage	14.127 ^a	(0.648)	13.940 ^a	(0.609)
LIS eligibility	-8.041 ^a	(0.344)	-7.916 ^a	(0.326)
Covariates in levels, lagged				
Premium	-0.438 ^a	(0.012)	-0.438 ^a	(0.012)
Drug price index	0.015	(0.015)	-0.001	(0.015)
N drugs covered, top100	0.162 ^a	(0.025)	0.144 ^a	(0.027)
N drugs covered, all	0.010 ^a	(0.002)	0.010 ^a	(0.002)
Average tier level, top100	5.702 ^a	(1.703)	4.835	(1.752)
Average tier level, all	-9.789 ^a	(2.258)	-9.859 ^a	(2.321)
Average restriction level, top100	1.096	(2.578)	6.531 ^a	(2.092)
Average restriction level, all	7.586 ^a	(2.120)	3.154	(2.688)
Benefit type	-1.054	(0.658)	-0.500	(0.705)
LIS status	-4.575 ^a	(0.399)	-4.440 ^a	(0.393)
Deductible	-0.006 ^a	(0.002)	-0.009 ^a	(0.002)
Gap coverage	15.947 ^a	(0.571)	15.836 ^a	(0.583)
Plan market share	-82.824 ^a	(13.030)	-80.761 ^a	(13.062)
Log plan enrollment, in ('000)	1.345 ^a	(0.212)	1.199 ^a	(0.210)
Plan LIS market share	6.560	(22.837)	19.665	(22.390)
Log LIS plan enrollment, in ('000)	-0.487 ^b	(0.211)	-0.519	(0.207)
% Merger plans		15.36		
% Merger plans in overlapping mkt		11.54		
% Consolidated plans		22.21		
% Consolidated merger plans in overlapping mkt		2.25		
N obs.		8,790		

Notes: This table details all of the coefficients on the controls from the main specification summarized in Tables 6 and 7. We report for the specification with market-year fixed effects; the control coefficients for the specification with insurer fixed effects are quantitatively similar. Coefficients on the number of drugs (NDCs) covered are scaled up by 100. Coefficient estimates that are significant at 1%, 5%, and 10% level are denoted with a, b, and c respectively. Standard errors are in parentheses.

Table 10: Merger and Consolidation Results: Formulary. Complete Output

	TOP 100 DRUGS				ALL NDC			
	(1)		(2)		(1)		(2)	
	Coef Est	Std Err	Coef Est	Std Err	Coef Est	Std Err	Coef Est	Std Err
Merger	1.106 ^a	(0.514)	1.167 ^b	(0.530)	261.0 ^a	(52.72)	269.9 ^a	(54.79)
Merger in overlapping mkt	-0.639	(0.633)	-2.060 ^a	(0.613)	-195.8 ^a	(63.57)	-328.0 ^a	(59.01)
Plan consolidation			-1.260 ^a	(0.237)			-93.80 ^a	(18.16)
Merger & Plan consolidation in overlapping market			7.437 ^a	(0.810)			615.03 ^a	(76.15)
Covariates in first differences								
Benefit type	1.759 ^a	(0.241)	2.030 ^a	(0.202)	403.4 ^a	(23.02)	422.25 ^a	(25.97)
Deductible	-0.005 ^a	(0.001)	-0.006	(0.001)	-0.345 ^a	(0.062)	-0.428 ^a	(0.068)
Gap coverage	2.400 ^a	(0.376)	2.227 ^a	(0.356)	670.15 ^a	(47.98)	639.3 ^a	(46.15)
LIS eligibility	0.587 ^b	(0.252)	0.403 ^c	(0.242)	65.31 ^a	(23.95)	44.28 ^c	(23.44)
Covariates in levels, lagged								
Premium	-0.038 ^a	(0.006)	-0.036 ^a	(0.006)	-0.922 ^c	(0.523)	-0.788	(0.526)
Drug price index	-0.065 ^a	(0.011)	-0.064 ^a	(0.011)	-8.455 ^a	(1.967)	-7.464 ^a	(1.981)
N drugs covered*	-0.339 ^a	(0.018)	-0.346 ^a	(0.017)	17.90 ^a	(2.026)	18.26 ^a	(1.981)
N drugs covered	0.007 ^a	(0.002)	-0.006 ^a	(0.002)	-0.600 ^a	(0.029)	-0.604 ^a	(0.029)
Avg tier*	-1.334	(1.340)	-0.932	(1.252)	-142.0	(243.7)	-33.22	(238.0)
Avg tier	-1.463	(1.591)	-1.253	(1.540)	-735.2 ^a	(236.6)	-681.1 ^a	(233.3)
Avg restriction*	7.764 ^a	(1.385)	-6.558 ^a	(1.054)	-171.5	(120.6)	-218.3 ^c	(120.5)
Avg restriction	-5.939 ^a	(1.071)	8.844 ^a	(1.318)	335.8 ^c	(189.4)	471.6 ^b	(185.5)
Benefit type	0.909 ^a	(0.203)	1.174 ^a	(0.196)	200.0 ^a	(21.57)	217.4 ^a	(22.48)
LIS status	0.467 ^c	(0.249)	0.419 ^c	(0.238)	56.41 ^c	(29.94)	41.06	(29.37)
Deductible	-0.004 ^a	(0.001)	-0.006 ^a	(0.001)	-0.145 ^c	(0.080)	-0.275 ^a	(0.080)
Gap coverage	2.689 ^a	(0.183)	2.625 ^a	(0.180)	320.1 ^a	(28.27)	317.0 ^a	(27.67)
Market share	9.781	(7.318)	10.295	(7.480)	3,288 ^a	(844.0)	3,345 ^a	(850.6)
Log enrollment	0.337 ^a	(0.091)	0.333 ^a	(0.092)	25.51 ^b	(12.56)	24.21 ^c	(12.64)
LIS mkt share	-64.50 ^a	(11.37)	-55.86 ^a	(11.46)	-7,113 ^a	(1,243)	-6,297 ^a	(1,230)
Log LIS enrollment	-0.095	(0.078)	-0.170 ^b	(0.079)	-10.52	(10.22)	-13.93	(10.24)
% Merger plans				15.36				
% Merger plans in overlapping mkt				11.54				
% Consolidated plans				22.21				
% Consolidated merger plans in overlapping mkt				2.25				
N obs.				8,790				7,401

Notes: This table details all of the coefficients from the main specification summarized in Table 6. We report for the specification with market-year fixed effects; the control coefficients for the specification with insurer fixed effects are quantitatively similar. Plan enrollment is in thousands of enrollees. Both formulary composition and restriction dependent variables are calculated for the top 100 drugs. A star, *, denotes that the covariate is calculated for top 100 drugs rather than for the entire set of NDCs. Coefficients on the covariate number of drugs (NDCs) covered are scaled up by 100. All coefficients in regressions with restrictions as a dependent variable are scaled up by 100. Coefficient estimates that are significant at 1%, 5%, and 10% level are denoted with a, b, and c respectively. Standard errors are in parentheses.

Table 11: Merger and Consolidation Results: Restrictions. Complete Output

	TOP 100 DRUGS				ALL NDC			
	(1)		(2)		(1)		(2)	
	Coef Est	Std Err	Coef Est	Std Err	Coef Est	Std Err	Coef Est	Std Err
Merger	-2.668 ^a	(0.634)	-0.026 ^a	(0.006)	0.094	(0.474)	0.034	(0.481)
Merger in overlapping mkt	5.305 ^a	(0.892)	0.064	(0.010)	0.040 ^a	(0.008)	0.056 ^a	(0.009)
Plan consolidation			-0.004	(0.003)			0.012 ^a	(0.002)
Merger & Plan consolidation in overlapping market			-0.058 ^a	(0.008)			-0.083 ^a	(0.008)
Covariates in first differences								
Benefit type	2.404 ^a	(0.218)	0.027 ^a	(0.002)	0.008 ^a	(0.002)	0.005 ^a	(0.002)
Deductible	-0.009 ^a	(0.002)	-0.009 ^a	(0.002)	-0.012 ^a	(0.002)	-0.011 ^a	(0.002)
Gap coverage	3.148 ^a	(0.354)	0.032 ^a	(0.004)	0.026 ^a	(0.003)	0.028 ^a	(0.003)
LIS eligibility	-1.835 ^a	(0.355)	-0.016 ^a	(0.004)	-0.006 ^c	(0.003)	-0.003	(0.003)
Covariates in levels, lagged								
Premium	-0.027 ^a	(0.010)	-0.029 ^a	(0.001)	-0.025 ^a	(0.009)	-0.027 ^a	(0.009)
Drug price index	0.031	(0.025)	0.024	(0.025)	0.051 ^b	(0.021)	0.048 ^b	(0.021)
N drugs covered*	0.054	(0.038)	0.054	(0.037)	0.026	(0.034)	0.032	(0.033)
N drugs covered	-0.003	(0.001)	-0.003	(0.001)	-0.002 ^a	(0.001)	-0.002 ^a	(0.001)
Avg tier*	4.782	(3.463)	0.041	(0.036)	-0.127 ^a	(0.026)	-0.132 ^a	(0.027)
Avg tier	-9.918 ^a	(3.590)	-0.101	(0.036)	0.060 ^c	(0.033)	0.057 ^c	(0.033)
Avg restriction*	-24.856 ^a	(4.391)	-0.125 ^a	(0.027)	0.018	(0.028)	0.191 ^a	(0.028)
Avg restriction	-12.722 ^a	(2.711)	-0.252 ^a	(0.044)	-0.555 ^a	(0.047)	-0.566 ^a	(0.047)
Benefit type	-0.906 ^a	(0.316)	-0.010 ^a	(0.003)	-0.016 ^a	(0.002)	-0.019 ^a	(0.002)
LIS status	-0.001	(0.502)	0.001	(0.005)	0.007 ^c	(0.004)	0.007 ^b	(0.004)
Deductible	-0.012 ^a	(0.002)	-0.011 ^a	(0.002)	-0.011 ^a	(0.002)	-0.009 ^a	(0.002)
Gap coverage	-0.475	(0.420)	-0.005	(0.004)	-0.005	(0.004)	-0.004	(0.004)
Market share	-29.751 ^a	(9.372)	-0.295	(0.094)	-0.239 ^a	(0.071)	-0.244 ^a	(0.073)
Log enrollment	0.542 ^a	(0.167)	0.005 ^a	(0.002)	0.007 ^a	(0.001)	0.007 ^a	(0.001)
LIS mkt share	10.752	(15.315)	0.070	(0.153)	0.383 ^a	(0.135)	0.290 ^b	(0.134)
Log LIS enrollment	0.021	(0.151)	0.001	(0.002)	-0.001	(0.001)	-0.001	(0.001)
% Merger plans				15.36				
% Merger plans in overlapping mkt				11.54				
% Consolidated plans				22.21				
% Consolidated merger plans in overlapping mkt				2.25				
N obs.				8,790				7,401

Notes: This table details all of the coefficients from the main specification summarized in Table 6. We report for the specification with market-year fixed effects; the control coefficients for the specification with insurer fixed effects are quantitatively similar. Plan enrollment is in thousands of enrollees. Both formulary composition and restriction dependent variables are calculated for the top 100 drugs. A star, *, denotes that the covariate is calculated for top 100 drugs rather than for the entire set of NDCs. Coefficients on the covariate number of drugs (NDCs) covered are scaled up by 100. All coefficients in regressions with restrictions as a dependent variable are scaled up by 100. Coefficient estimates that are significant at 1%, 5%, and 10% level are denoted with a, b, and c respectively. Standard errors are in parentheses.

Table 12: Merger and Consolidation Results: Price Index. Complete Output

	(1)		(2)	
	Coef Est	Std Err	Coef Est	Std Err
Merger	1.729 ^a	(0.389)	1.643 ^a	(0.409)
Merger in overlapping mkt	-2.271 ^a	(0.551)	-2.060 ^a	(0.613)
Plan consolidation			1.773 ^a	(0.368)
Merger & Plan consolidation in overlapping market			-9.200 ^a	(0.907)
Covariates in first differences				
Benefit type	-1.614 ^a	(0.368)	-2.029 ^a	(0.328)
Deductible	-0.004 ^a	(0.001)	-0.002 ^b	(0.001)
Gap coverage	-2.176 ^a	(0.500)	-1.958 ^a	(0.475)
LIS eligibility	1.513	(0.345)	1.729 ^a	(0.334)
Covariates in levels, lagged				
Premium	0.043	(1.121)	-0.002	(0.011)
Drug price index	-0.589 ^a	(0.023)	-0.590 ^a	(0.021)
N drugs covered*	-0.392	(0.028)	-0.383 ^a	(0.027)
N drugs covered	0.010 ^a	(0.003)	0.009 ^a	(0.003)
Avg tier*	-13.486 ^a	(2.232)	-13.929 ^a	(2.120)
Avg tier	4.129	(2.812)	3.878	(2.731)
Avg restriction*	14.408 ^a	(1.173)	15.212 ^a	(1.131)
Avg restriction	-19.837	(1.636)	-21.249 ^a	(1.523)
Benefit type	0.094	(0.382)	-0.255	(0.378)
LIS status	0.915	(0.476)	0.967 ^b	(0.455)
Deductible	-0.005 ^a	(0.001)	-0.003 ^b	(0.001)
Gap coverage	-2.070 ^a	(0.440)	-1.986 ^a	(0.419)
Market share	-36.138 ^a	(11.568)	-36.865 ^a	(11.828)
Log enrollment	-0.216	(0.169)	-0.203	(0.165)
LIS mkt share	85.301 ^a	(18.760)	74.170 ^a	(18.966)
Log LIS enrollment	0.014	(0.167)	0.107	(0.164)
% Merger plans		15.36		
% Merger plans in overlapping mkt		11.54		
% Consolidated plans		22.21		
% Consolidated merger plans in overlapping mkt		2.25		
N obs.		8,790		

Notes: This table details all of the coefficients from the main specification summarized in Table 6. We report for the specification with market-year fixed effects; the control coefficients for the specification with insurer fixed effects are quantitatively similar. Plan enrollment is in thousands enrollees. Both formulary composition and restrictions dependent variable is calculated for the top 100 drugs. A star, *, denotes that the covariate is calculated for top 100 drugs rather than for the entire set of NDCs. Coefficients on the covariate number of drugs (NDCs) covered are scaled up by 100. All coefficients in regressions with restrictions as a dependent variable are scaled up by 100. Coefficient estimates that are significant at 1%, 5%, and 10% level are denoted with a, b, and c respectively. Standard errors are in parentheses.

Table 13: Merger and Consolidation Results: Tiers. Complete Output

	TOP 100 DRUGS				ALL NDC			
	(1)		(2)		(1)		(2)	
	Coef Est	Std Err	Coef Est	Std Err	Coef Est	Std Err	Coef Est	Std Err
Merger	-0.017	(0.011)	-0.016	(0.011)	-0.007	(0.006)	-0.006	(0.006)
Merger in overlapping mkt	0.005	(0.013)	-0.005	(0.013)	-0.012	(0.065)	-0.003	(0.064)
Plan consolidation			-0.027 ^a	(0.002)			-0.019 ^a	(0.003)
Merger & Plan consolidation in overlapping market			0.050 ^a	(0.010)			-0.007	(0.006)
Covariates in first differences								
Benefit type	0.009 ^a	(0.003)	0.018 ^a	(0.003)	0.026 ^a	(0.002)	0.033 ^a	(0.003)
Deductible	0.004 ^a	(0.001)	0.001	(0.001)	-0.004 ^a	(0.002)	-0.006 ^a	(0.002)
Gap coverage	0.028 ^a	(0.003)	0.026 ^a	(0.003)	0.036 ^a	(0.003)	0.036 ^a	(0.003)
LIS eligibility	0.002	0.003	0.002	(0.003)	0.010 ^a	(0.003)	0.011 ^a	(0.003)
Covariates in levels, lagged								
Premium	-0.028	(0.009)	-0.027 ^a	(0.009)	-0.047 ^a	(0.006)	-0.047 ^a	(0.006)
Drug price index	0.167 ^a	(0.014)	0.161 ^a	(0.015)	0.044 ^a	(0.010)	0.036 ^a	(0.010)
N drugs covered*	0.005 ^a	(0.001)	0.466 ^a	(0.040)	0.286 ^a	(0.035)	0.280 ^a	(0.035)
N drugs covered	0.003 ^a	(0.0001)	0.003 ^a	(0.001)	0.002 ^a	(0.0001)	0.002 ^a	(0.0001)
Avg tier*	-0.696 ^a	0.018	-0.698 ^a	(0.018)	-0.242 ^a	(0.017)	-0.248 ^a	(0.017)
Avg tier	0.062 ^b	(0.024)	0.062 ^a	(0.024)	-0.346 ^a	(0.025)	-0.347 ^a	(0.025)
Avg restriction*	-0.010	(0.024)	-0.017	(0.024)	0.006	(0.012)	0.003	(0.012)
Avg restriction	-0.043	(0.027)	-0.029	(0.025)	-0.066 ^a	(0.016)	-0.060 ^a	(0.016)
Benefit type	0.007 ^b	(0.003)	0.011 ^a	(0.003)	0.010 ^a	(0.002)	0.012 ^a	(0.002)
LIS status	0.013 ^a	(0.003)	0.014 ^a	(0.004)	0.023 ^a	(0.003)	0.024 ^a	(0.003)
Deductible	0.004 ^a	(0.001)	0.002	(0.001)	-0.002 ^a	(0.001)	-0.003 ^a	(0.001)
Gap coverage	0.037 ^a	(0.003)	0.037 ^a	(0.003)	0.033 ^a	(0.002)	0.032 ^a	(0.002)
Market share	0.378 ^a	(0.095)	0.389 ^a	(0.095)	0.319 ^a	(0.070)	0.327 ^a	(0.070)
Log enrollment	0.006 ^a	(0.002)	0.005 ^a	(0.002)	0.006 ^a	(0.001)	0.005 ^a	(0.001)
LIS mkt share	-0.608 ^a	(0.183)	-0.511 ^a	(0.188)	-0.333 ^b	(0.153)	-0.298 ^c	(0.154)
Log LIS enrollment	-0.009 ^a	(0.001)	-0.009 ^a	(0.001)	-0.009 ^a	(0.001)	-0.008 ^a	(0.001)
% Merger plans				15.36				
% Merger plans in overlapping mkt				11.54				
% Consolidated plans				22.21				
% Consolidated merger plans in overlapping mkt				2.25				
N obs.				8,790				7,401

Notes: This table details all of the coefficients from the main specification summarized in Table 6. We report for the specification with market-year fixed effects; the control coefficients for the specification with insurer fixed effects are quantitatively similar. Plan enrollment is in thousands enrollees. Both formulary composition and restrictions dependent variables are calculated for the top 100 drugs. A star, *, denotes that the covariate is calculated for top 100 drugs rather than for the entire set of NDCs. Coefficients on the covariate number of drugs (NDCs) covered are scaled up by 100. All coefficients in regressions with restrictions as a dependent variable are scaled up by 100. Coefficient estimates that are significant at 1%, 5%, and 10% level are denoted with a, b, and c respectively. Standard errors are in parentheses.

C Appendix: Bargaining Model

In this section we outline a multi-level, multi-lateral bargaining model using the Ho and Lee (2015) framework. The model captures the key features of national and local level bargaining and that is useful for interpreting our empirical results.

Medicare Part D plans are offered by private insurance companies that set premiums and determine coverage (formulary composition, prescription prices, and copays). Insurers negotiate coverage with two types of upstream suppliers: prescription drug manufacturers (national level) and pharmacies (local level). Insurers can operate in multiple markets (Medicare Part D “regions”) and offer multiple plans in each market that differ in their premiums, cost sharing, and drug access provisions.

At the national level, insurers $j \in 1 \dots J$ engage in simultaneous bilateral Nash bargaining with drug manufacturers $d \in 1 \dots D$ about the inclusion of drugs on formularies in exchange for rebates paid from drug manufacturers to insurers. If insurer j and drug manufacturer d reach an agreement to include the drug on the formulary, d pays a rebate r_{jd} per prescription filled by insurer j ’s enrollees. We assume that the rebate is common across all plans, ruling out the possibility of contracting for different rebates based on geography or plan type. If the parties fail to reach an agreement, the drug is not covered under any of insurer j ’s plans and no rebates are paid. Let \mathcal{F}_j denote the set of drugs included on insurer j ’s formulary.

Rebates are proprietary, and we cannot confirm whether they are commonly negotiated and paid on a per-prescription basis. However, Medicare requires insurers to report rebates and to pass along a proportional share when determining the government’s liability for low income cost sharing, risk corridors, and reinsurance. For this reason, we suspect our assumption is plausible. Otherwise insurers would be able to allocate rebates in a way that games the subsidy and risk sharing design. Note that it is also common for an insurer to have the same formulary across plans and markets, supporting the assumption about a common formulary. However there are exceptions which we model as access restrictions in the local level bargaining process.

At the local level, in each market m , insurers engage in simultaneous bilateral Nash bargaining with local pharmacies k about access restrictions for drugs a_{jkm} and pharmacy pricing p_{jkm} . We assume local negotiations over access and pricing are common across all drugs and that insurers and pharmacy do not negotiate over terms for specific drugs. We assume pharmacies are not affiliated with drug manufacturers.¹² Therefore, drug rebate negotiations at the national level are separate from access and pharmacy pricing negotiations that occur at the local level. However, in a “Nash-in-Nash” bargaining solution, the equilibrium outcome of negotiations at each level will be affected by the outcome in the other level, in much the same way that bilateral negotiations amongst different drug manufacturers will affect one another. Denote by \mathcal{P}_{jm} the network of pharmacies that j reaches an agreement with in market m .

We also consider a variant of the model in which access is negotiated with the local suppliers of the drug manufacturers. In this case, access is denoted by a_{djm} and varies across markets and drugs,

¹²There are some vertically integrated insurer-pharmacy companies such as CVS Caremark, but to the best of our knowledge, no vertically integrated drug manufacturer-pharmacy.

but pharmacies. Upon disagreement, the drug is removed from the formulary in market m , even if an agreement has otherwise been reached at the national level. The drug manufacturers bargaining representative at the local supplier level does not coordinate with the representative in charge of negotiating national rebates. A blend of pharmacy and local drug supplier negotiations over access most realistically captures the market because we observe measures of access (formulary composition, restrictions, copay tiers) vary across markets, pharmacies, and drugs. Denote by the blended a_{djkm} access level determined by pharmacy and drug supplier negotiations.

Here we define objective functions of enrollees, insurers, drug manufacturers, and local pharmacies. Individuals eligible for Medicare, select plans in their home market m , based on premiums, ϕ_{jm} , drug formularies, \mathcal{F}_j , and local pharmacy networks, \mathcal{P}_{jm} . We start by assuming that demand for plans does not depend on drug access or pharmacy pricing. Denote the market demand for plan j as $D_{jm}(\phi_m, \mathcal{F}, \mathcal{P}_m)$. Demand is decreasing in premium, and increasing in the scope of drugs on the formulary and size of the pharmacy network.

Demand for drug d at pharmacy k by enrollees of insurer j in market m is given by $D_{djkm}^{rx}(\mathcal{F}_j, \mathcal{P}_{jm})a_{jkm}$. In this specification drug demand depends on formulary composition \mathcal{F}_j , pharmacy networks \mathcal{P}_{jm} , and is a linear function of pharmacy access a_{jkm} . Let $D_{jkm}^{rx}a_{jkm}$ (no drug subscript) denote patient demand for a representative basket of drugs by enrollees in plan j at pharmacy k . If access is negotiated with drug suppliers, demand for drug d at a representative pharmacy is given by $D_{djkm}^{rx}(\mathcal{F}_{jm}, \mathcal{P})a_{djkm}$. Note in this specification that formularies \mathcal{F}_{jm} are market specific.

Insurers seek to maximize profits when setting premiums and negotiating drug coverage terms. Insurer j 's profit is a sum of market-level profits and is a difference between collected premiums and payments for filled prescriptions less rebates from drug manufacturers:

$$\pi_j(\mathcal{F}, \mathcal{P}, \mathbf{r}, \mathbf{a}, \mathbf{p}) = \sum_m \left(D_{jm}\phi_{jm} - \sum_{k \in \mathcal{P}_{jm}} \sum_{d \in \mathcal{F}_{jd}} D_{djkm}^{rx} a_{djkm} (p_{jkm} - r_{dj}) \right) \quad (6)$$

Drug manufacturer profits are given by:

$$\pi_d(\mathcal{F}, \mathcal{P}, \mathbf{r}, \mathbf{a}, \mathbf{p}) = \sum_m \sum_{k \in \mathcal{P}_{jm}} \sum_{j \in \mathcal{F}_d} D_{djkm}^{rx} a_{djkm}^{rx} (p^w - r_{dj} - c_d) \quad (7)$$

where the value p^w is the wholesale price of drugs sold to pharmacies and c_d is the manufacturing cost and \mathcal{F}_{dm} is the set of formularies that cover drug d . We assume that wholesale drug prices are determined by manufacturers and pharmacies outside of the Part D bargaining context. For ease of notation we normalize wholesale prices for all drugs to a common value, p^w , so that negotiated pharmacy prices p_{jkm} can be viewed as the markup that pharmacies charge over the wholesale price.

Local pharmacy profits are given by:

$$\pi_k(\mathcal{F}_m, \mathcal{P}_m, \mathbf{r}, \mathbf{a}_m, \mathbf{p}_m) = \sum_{j \in \mathcal{P}_{km}} \sum_{d \in \mathcal{F}_{jm}} D_{djkm}^{rx} a_{jkm} (p_{jkm} - p^w) \quad (8)$$

National Bargaining with Drug Manufacturers

For any given insurer drug manufacturer pair, rebates are negotiated via Nash Bargaining. The rebate maximizes the bilateral Nash product

$$r_{dj} = \operatorname{argmax} [\pi_j(\mathcal{F}, \mathcal{P}, \mathbf{r}, \mathbf{a}, \mathbf{p}) - \tilde{\pi}_j(\mathcal{F}_{-jd}, \mathcal{P}, \mathbf{r}_{-jd}, \mathbf{a}, \mathbf{p})]^{\tau_j} [\pi_d(\mathcal{F}, \mathcal{P}, \mathbf{r}, \mathbf{a}, \mathbf{p}) - \tilde{\pi}_j(\mathcal{F}_{-jd}, \mathcal{P}, \mathbf{r}_{-jd}, \mathbf{a}, \mathbf{p})]^{\tau_d} \quad (9)$$

For intuition about the bargaining process, consider an example with one insurer offering plans in m markets and two drug manufacturers (A and B) in which there is some degree of therapeutic substitutability across drugs. Let pharmacy pricing p_m and access a_m represent average negotiated values across pharmacies. The Nash bargaining problem for insurer j and the manufacturer of drug A solves:

$$r_{jA} = \operatorname{argmax} \left[\sum_m \left(D_m \phi_m - D_{Am}^{rx} a_m (p_m - r) - D_{Bm}^{rx} a_m (p_m - r_B) - \left[\tilde{D}_m \phi_m - \tilde{D}_{Bm}^{rx} a_m (p_m - r_B) \right] \right) \right] \left[\sum_m D_{Am}^{rx} a_m (p^w - r - c_A) \right] \quad (10)$$

where the terms \tilde{D}_m and \tilde{D}_{Bm}^{rx} represent demand for the insurer's plan and demand for drug B if the insurer's formulary excludes drug A. Taking the first order conditions yields a solution for rebate for drug A, r_A :

$$\begin{aligned} r_{jA} = & - \left[\sum_m D_m \phi_m - \sum_m \tilde{D}_m \phi_m \right] / (2 \sum_m D_{Am}^{rx} a_m) \\ & + \left[\sum_m D_{Bm}^{rx} a_m (p_m - r_B) - \sum_m \tilde{D}_{Bm}^{rx} a_m (p_m - r_B) \right] / (2 \sum_m D_{Am}^{rx} a_m) \\ & + p_m / 2 \\ & + (p^w - c_A) / 2 \end{aligned} \quad (11)$$

The solution to the bargaining problems is characterized by four terms. The first term is the premium revenue effect as described in Ho and Lee (2015). Because consumers' plan demand depends on formulary composition, the insurer would lose enrollees substituting to other plans (or the outside option) if it excludes drug A from its formulary; that is $D_m - \tilde{D}_m > 0$. The greater the loss in enrollees, the weaker is the insurer's bargaining position and hence the lower the rebate it can negotiate from drug manufacturers.

The second term accounts for the degree of substitutability in prescription demand across drugs. If drug A and B are therapeutic substitutes, demand for drug B increases when A is excluded from the formula: $D_{Bm}^{rx} - \tilde{D}_{Bm}^{rx} < 0$. With more substitutability, the insurer improves its bargaining position to negotiate a higher rebate. There is a reinforcement effect. If the insurer negotiates a high rebate r_B on drug B it can negotiate a high rebate on drug A. If the drugs are complements, $D_{Bm}^{rx} - \tilde{D}_{Bm}^{rx} > 0$, then the insurer cannot negotiate as high of a rebate on drug A.

The third term highlights the effect that local bargaining with pharmacies over prices p_{jm} has on negotiated national drug rebates. If the insurer negotiates favorable (drug-usage weighted average) pricing terms with pharmacies in local markets, low p_m , then the insurer will get smaller rebates from national drug manufacturers.

The final term reflects the bargaining position of the drug manufacturer with respect to its cost c_A . The higher the wholesale price-cost $p^w - c_A$ margin on the drug, the higher is the rebate that the manufacturer pays.

Drug access negotiated with pharmacies, a_m , affects national bargaining over rebates through the premium term. With lower access, the premium effect attenuates, decreasing drug manufacturer's bargaining position and raising the rebate. In the special case with $a_m = a$ for all markets and drugs, the access effect vanishes from the second drug substitutability term, otherwise it has a second order effect based on variability in drug demand D_{dm}^{rx} and access a_m across markets.

When drug access is negotiated with drug manufacturers on a drug-by-drug and market-by-market basis a_{dm} , rather than solely on a market basis a_m , the second term in the bargaining solutions changes.

$$\begin{aligned}
r_{jA} = & - \left[\sum_m D_m \phi_m - \sum_m \tilde{D}_m \phi_m \right] / (2 \sum_m D_{Am}^{rx} a_{Am}) \\
& + \left[\sum_m D_{Bm}^{rx} a_{Bm} (p_m - r_B) - \sum_m \tilde{D}_{Bm}^{rx} a_{Bm} (p_m - r_B) \right] / (2 \sum_m D_{Am}^{rx} a_{Am}) \\
& + p_m / 2 \\
& + (p^w - c_A) / 2
\end{aligned} \tag{12}$$

In this case, the relative access levels between drug A and drug B a_{Bm}/a_{Am} matter for rebate negotiates. If drug B has high access levels and is a substitute for drug A, then the insurer improves its bargaining position to negotiate a high rebate, but if A has high access, its bargaining position for rebates on drug A weakens.

Local Bargaining with Pharmacies

For each market m and insurer-pharmacy pair (jk), drug prices and access are negotiated via simultaneous Nash bargaining. The access level and price maximizes the bilateral Nash product

$$(p_{jk}, a_{jk}) = \underset{p, a}{\operatorname{argmax}} [\pi_j(\mathcal{F}, \mathcal{P}, \mathbf{r}, \mathbf{a}, \mathbf{p}) - \tilde{\pi}_j(\mathcal{F}, \mathcal{P}_{-jk}, \mathbf{r}, \mathbf{a}_{-jk}, \mathbf{p}_{-jk})]^{r_j} [\pi_k(\mathcal{F}, \mathcal{P}, \mathbf{r}, \mathbf{a}, \mathbf{p}) - \tilde{\pi}_j(\mathcal{F}, \mathcal{P}_{-jk}, \mathbf{r}, \mathbf{a}_{-jk}, \mathbf{p}_{-jk})]^{r_k} \quad (13)$$

Market m subscripts have been dropped because bargaining occurs strictly at the local market level and there are no cross market pharmacy bargaining effects.

Consider an example with one insurer and two competing pharmacies (A,B) in which the parties have equal bargaining weights. Because pharmacies and insurers do not contract on a drug-by-drug basis, but rather over uniform price and access levels for all drugs, the rebate term r can be interpreted as an average rebate level across all drugs and drug demand D_{jk} as the pharmacy demand for a representative basket of drugs covered by the insurer. The terms \tilde{D} and \tilde{D}_B represent the demand for the insurer's plans and drug demand of the insurer's enrollees at the other pharmacy B if the insurer fails to reach an agreement with pharmacy A. The Nash bargaining problem solves

$$(a_{jA}, p_{jA}) = \underset{a, p}{\operatorname{argmax}} \left[\left(D\phi - D_A^{rx} a(p-r) - D_B^{rx} a_B(p_B-r) - \left[\tilde{D}\phi - \tilde{D}_B^{rx} a_B(p_B-r) \right] \right) \right] \quad (14)$$

$$[D_A^{rx} a(p-p^w)]$$

The solution to the bargaining problem satisfies the first order conditions in price p and access a given by:

$$p = + \phi \left[D - \tilde{D} \right] / (2D_A^{rx} a) \quad (15)$$

$$- \left[D_B^{rx} a_B(p_B-r) - \tilde{D}_B^{rx} a_B(p_B-r) \right] / (2D_A^{rx} a)$$

$$+ (p^w + r)/2$$

$$a = + \phi \left[D - \tilde{D} \right] / (2D_A [p-r]) \quad (16)$$

$$- \left[D_B a_B(p_B-r) - \tilde{D}_B a_B(p_B-r) \right] / (2D_A [p-r])$$

Negotiated pharmacy prices depends on three terms. The first term is the premium effect. Insurers pay higher prices if plan demand substitutes heavily away from the insurer if it excludes the pharmacy; that is if $D - \tilde{D} > 0$. The size of the substitution effect will largely depend on the sensitivity of consumers' plan demand to pharmacy networks. The second term captures the effect of pharmacy competition. If the insurer negotiates favorable pricing p_B and access a_B terms with pharmacy B and enrollees easily substitute to that pharmacy if A is excluded, $D_B^{rx} - \tilde{D}_B^{rx} < 0$, then the insurer has a better bargaining position to negotiate lower prices with A. In addition, if the insurer negotiates large drug rebates from manufacturers, then a large pharmacy substitution effect allows the insurer to negotiate lower prices. The magnitudes of the premium and pharmacy competition effect depend on access levels which appear

in the denominator. There is a tradeoff between price and access in negotiations. If the pharmacy agrees to lower access it is able to negotiate higher prices. The third term captures the direct effect of drug wholesale prices and manufacturer rebates on pharmacy prices. High wholesale prices, a cost to pharmacies, translate to high prices paid by insurers; large rebates, a cost savings for insurers, high pharmacy prices.

Negotiated drug access levels have a premium and pharmacy competition effect. Analogous to prices, greater enrollment substitution, results in higher access which is beneficial for pharmacy sales, and more pharmacy competition improves the insurer's bargaining position. There is also a tradeoff between prices and access. Higher prices induce lower access. Rebates from national drug manufacturers influence access through the premium and pharmacy competition channels. Higher rebates improve the pharmacy's bargaining position, opening up higher drug access.

When drug access is negotiated between the insurer and two drug suppliers A and B rather than pharmacies, the bargaining solution over access is:

$$a = +\phi \left[D - \tilde{D} \right] / (2D_A^{rx} [p - r_A]) - \left[D_B^{rx} a_B (p - r_B) - \tilde{D}_B^{rx} a_B (p - r_B) \right] / (2D_A^{rx} [p - r_A]) \quad (17)$$

The notable difference is that D_A^{rx} and D_B^{rx} represent demand across drugs, p is constant across drugs, and rebates r_A and r_B differ across drugs. The premium effect increases access if enrollees substitute away from the plan if drug A is excluded, and a strong drug substitutability effect allows insurers to negotiate lower access. Higher pharmacy prices translate into lower access, higher rebates on drug A improve access, while high rebates on the substitute drug B decrease access.

Effect of Mergers on Bargaining

When insurers merge the bargaining positions with drug manufacturers and pharmacies change. We consider three types of mergers regarding market overlap.

1. Complete market overlap of merging parties
2. No market overlap
3. Partial market overlap

The outcomes in each case highlight the interaction of local and national level bargaining effects that we find in our empirical work.

Direct Merger effects with Drug Manufacturers: Market Share, Market Size, Premiums

There are three direct channels affecting negotiations with drug manufacturers over rebates. First is the market share effect. For mergers with market overlap, insurers improve their bargaining position because the threat of enrollees leaving their plans diminishes. That is, some of the enrollees leaving an insurer's plan if it dropped drug A, would substitute to another plan offered by the merging partner, not necessarily to a rival insurer. In the premium component of the bargaining equation, enrollment substitution, $D_j - \tilde{D}_j$, shrinks, which raises the rebate paid by drug manufacturers. The market share effect also

acts through the drug manufacturer competition channel (second term), because under disagreement the merged insurer would direct a larger share of consumers towards the rival drug.

Countering the market share effect is a market size effect. If upon disagreement consumers do not substitute to another one of the combined insurer's plans, but rather to a rival, then the stakes in the premium channel effectively doubles to $2 \times (D_j - \tilde{D}_j)$, resulting in lower rebates. A similar market size-doubling argument applies to the drug manufacturer competition channel. The net effect of mergers on rebates is ambiguous, depending on whether the market share or market size effects dominate. However in the case with no market overlap, the market size effect is the only channel at play. Because of market boundaries, enrollees cannot substitute to a plan offered by the merging partner. The market size increases simply because the merged insurer offers plans in more markets. The net effect is not ambiguous, rebates decrease. For mergers with partial overlap, the effect rebates lies in between the range for complete and no market overlap.

The third direct effect comes from market power over premiums. We find a strong effect that merging insurers raise premiums in markets with overlap. Like the market size effect, a premium rise increases the bargaining stakes via the premium channel, resulting in lower rebates. With no market overlap this effect is absent because insurers do not gain local market power to raise premiums.

Mergers have analogous effects on bargaining with local drug suppliers over access in markets with overlap. The market share effect decreases access, the market size effect increases access, and market power over premiums raises access. There are no direct effects in markets with no overlap nor spillover effects in partial overlap mergers because access is negotiated locally. However, if access negotiations occur at the national level, the market size effect results in increased access for merger with no overlap.

Direct Merger effects with Pharmacies: Market Share, Market Size, Premiums

Next, we turn to the effect of mergers on local bargaining with pharmacies. Just like the negotiations with drug manufacturers, there is a market share, market size, and market power over premium effect. With less substitution of market share to rival insurers, a merged insurers improves its bargaining position to negotiate lower pharmacy prices and lower access. However, with greater market share and higher premiums at stake, pharmacies can bargaining for higher prices and greater access. The net effect is ambiguous. However in markets with no overlap, all three of these effects vanish. At the local level there is no change in market structure. There are no cross-market effects, so for non-overlapping markets it does not matter whether the merger has no market overlap or partial overlap.

Drug Manufacturer-Pharmacy Interactive Merger Bargaining Effects

Finally, we consider the interactive effects that mergers have on the drug manufacturer bargaining process and pharmacy bargaining process. Our conclusions show that these interactions create local bargaining effects even in mergers with no market overlap.

Rebates from drug manufacturers unambiguously decline in mergers with no market overlap. Lower rebates reduce the price that insurers pay to pharmacies directly through the third term in the pharmacy equation and through the second, pharmacy competition term. Lower pharmacy prices at the local level have a reinforcing effect of reducing rebates negotiated with drug manufacturers. Lower rebates also reduce the level of drug access (regardless of whether access is negotiated with pharmacies or drug

suppliers) which reinforces a low rebate negotiated with drug manufacturers. Overall, the theory predicts rebates, drug access, and prices decline in mergers with no market overlap. Empirically, we would expect to observe higher premiums, more restrictive formularies and lower pharmacy prices. In fact we observe the opposite, which we explain by turning to the predictions for overlapping and partially overlapping mergers.

In overlapping mergers, the direct effect on rebates, pharmacy prices, and access are ambiguous. Suppose the merger induces a very strong market share effect regarding plan enrollment with respect to both drug formularies and pharmacy networks. In this case, the insurer's bargaining position improves. The direct channels predict higher rebates, lower pharmacy prices, and lower access. The interactive effects of pharmacy and drug manufacturer bargaining—the effect of price and access on rebates and rebates on price and access—attenuate the magnitudes (see bargaining solution equations). If the market share effect is relatively strong with respect to drug formularies but not with pharmacies (that is enrollees care more about formularies than pharmacy networks when choosing plans) then higher rebates prevail and pharmacy prices and access will be little changed. If instead, enrollment responds more to pharmacy networks, then rebates will be little changed, while pharmacy prices and access are low.

The conclusions change slightly if access is negotiated with drug suppliers. If the market share effect is strong with respect to formularies, rebates increase and access decreases, while pharmacy prices remain unchanged. If enrollment responds more to pharmacies, then rebates and access will be little changed, while prices decline.

For mergers with partial market overlap, the higher rebates achieved in overlapping markets will be shared in non-overlapping markets. Rebate changes affect local bargaining even if there are otherwise no market share or market size effects. With higher rebates, negotiated pharmacy prices increase and access improves. Empirically, we observe this pattern in non-overlapping markets. Premiums decline slightly, indicative of slightly higher rebates passed through premiums. Both pharmacy prices and access both increase significantly. The high sensitivity of pricing to a small rebate increase suggests plan enrollment highly depends on pharmacy networks. The small rebate increase and large increase in access not only suggests high dependence of demand on pharmacy networks, but also indicates pharmacy network bargaining, not drug manufacturer bargaining determines for access. If access is negotiated locally with drug manufacturers (in which case drug substitution matters) we would expect the small increase in rebates to be accompanied by a small increase in access.

If access is negotiated nationally with drug manufacturers, rebates would increase and access decrease in overlapping markets. Both would spillover to the merged insurers non-overlapping markets.

Relating Bargaining Model Predictions to Empirical Results

The empirical results for overlapping markets are consistent with our predictions. In overlapping market we observe much higher premiums which indicates rebate increases dwarf in comparison to merging insurers gain in market power. Concurrently pharmacy prices and access remain almost unchanged indicating that the market size, market share, and premium effects nearly balance out in pharmacy negotiations. There is perhaps some decrease in access, which would be consistent with an increase in

bargaining power over access with drug suppliers. Alternatively the results could indicate mergers have no effect on bargaining, rather there is only a market power over premiums.

The results for non-overlapping markets in mergers with partial overlap suggests insurers are able to bargain for higher rebates. Higher rebates appear directly as slightly lower premiums, and indirectly through the effect that rebates have on local bargaining as higher pharmacy prices and increased access. We do not find strong evidence that access restrictions are negotiated nationally with drug manufacturers, otherwise we would expect access to decline in both overlapping and non-overlapping markets.

The large response of pricing and access in non-overlapping markets to a small change in rebates suggests consumer demand responds more to pharmacy networks than formulary composition and is thus relatively more important for bargaining.

We can also use our results to distinguish the relative importance of market size versus market share effects. If market size effects dominate, we would observe a small rebate effect or even a decrease in rebates regardless of whether it is an overlapping or non-overlapping merger market. This could be consistent with our results of a small decrease in premiums in non-overlapping markets and increase in overlapping markets. However, we would also expect to observe a large increase in pharmacy prices and access in overlapping markets because the market size effects benefits the bargaining position of pharmacies. In fact, we observe almost no change. In non-overlapping markets, we would expect no change in pharmacy prices and access (or possibly a decrease in price and increase in access due to lower rebates). We observe the opposite, a large increase in price and decline in access.

It would be interesting to extend our intuition from this model to plan consolidation. Perhaps consolidation has a differing market size versus market share effect? Finally, we could more explicitly allow for consumers' plan demand to respond to access, and to allow consumers' drug demand to respond to pharmacy prices.