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ABSTRACT

A controversial feature of Medicare Part D is its reliance on private insurers to negotiate drug prices and rebates with retail pharmacies and drug manufacturers. Central to this controversy is whether increases in market power—an undesirable feature in most settings—confer benefits in health insurance markets, where larger buyers may obtain better prices for their members. We test whether insurers that experience larger enrollment increases due to Part D negotiate lower drug prices with pharmacies. Overall, we find that 100,000 additional insureds lead to 2.5-percent lower pharmacy prices negotiated by the insurer, and 5-percent reductions in pharmacy profits earned on prescriptions filled by enrollees of that insurer. Estimated enrollment effects are much larger for drugs with therapeutic substitutes, and virtually zero for branded drugs without therapeutic substitutes. We also present evidence that most insurer savings are, on the margin, passed on as lower premiums. Out-of-sample estimation suggests that modest insurer consolidation would generate significant savings to Medicare, along with premium reductions and enrollment increases. Finally, we find that greater enrollment leads to lower pharmacy prices negotiated by insurers for their non-Part D market—an external benefit to the commercially enrolled associated with administering Part D through private insurers.

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1. Introduction

The Medicare Modernization Act (MMA) of 2003 established prescription drug benefits for Medicare beneficiaries through Medicare Part D. The legislation tasked the private-sector with a substantial role, not unlike that played by Medicare health maintenance organizations (HMO's). The federal government prescribes a standard Part D benefit package and provides premium subsidies for Medicare beneficiaries. Private insurers compete among themselves to design, price, and administer insurance policies that are at least actuarially equivalent to this prescribed package. Controversy surrounds the role of private insurers in Part D, particularly as it relates to the negotiation and determination of drug prices.

The MMA increased the number of Medicare beneficiaries with prescription drug coverage and injected new customers into the insurance market. Since this increase was absorbed primarily by existing insurance firms, not new entrants, the MMA generally increased the enrolled population in each firm. In many economic contexts, increases in market power would be considered an undesirable side effect of policy. In this context, however, the operation and consequences of market power are less clear. Arguments for the possible impact of firm size on negotiations with suppliers have been posited since Galbraith (1952), and studied more formally in recent theoretical and empirical work.[1] In the pharmaceutical industry, where the distribution of rents between manufacturers, retail pharmacies, insurers and enrollees has implications for health care costs, insurance coverage, and incentives to innovate, changes to the bargaining power of insurers can have a variety of impacts that have not been widely studied.[2]

[1] Among many theoretical studies on the topic, recent work includes Stole and Zwiebel (1996), Brooks et al (1997), Chipty and Snyder (1999), and Raskovich (2003), who specify concavity conditions that the supplier's surplus function must satisfy in order for large buyers to extract rents. Snyder (1996) studies this issue in dynamic settings. In the health literature, Sorenson (2003) studies the extent to which insurers' ability to exclude hospitals affect negotiated hospital (supplier) prices. He finds this effect to be larger than the impact of insurer size. We extend these findings to the pharmaceutical market, and explicitly test a model in which buyer size can either augment or diminish the impact of network exclusion on negotiated prices.

[2] The health care literature has primarily focused on how characteristics of providers affect negotiations with downstream payers (Town and Vistnes 1999). More recently, Ho (2009) studies how hospital performance and provider network structure affect bargaining outcomes with downstream payers. In the pharmaceutical industry, the complex market structure and paucity of negotiated price data makes these issues difficult to study. Exceptions include Duggan and Scott-Morton (2008), who estimate the impact of Part D on aggregate prices and utilization; and Ellison and Snyder (2008), who examine the extent to which larger pharmacies extract rents from wholesalers on purchases of generic antibiotics. That buyer size may differentially affect price negotiations across drugs of varying substitutability is a hypothesis we test in the context of negotiations by nearly every Part D insurer, over the price of each of the top 1000 selling drugs in this market.

Several researchers have suggested the importance of insurer bargaining in Part D drug pricing and cost-containment (Duggan and Scott Morton, 2008; Frank and Newhouse, 2008). As those researchers note, the mechanism has its limits, and its effectiveness remains an empirical question. In this paper, we develop and test the hypothesis that Part D has led to greater insurer bargaining power, and a corresponding decline in pharmaceutical prices. We examine the overall strength of this effect, how it varies across different segments of the pharmaceutical marketplace, the impacts on consumer insurance premiums, and the spillover effects on the non-Part D marketplace. If Part D enrollment strengthens the hands of participating insurers, their non-Part D enrollees might also benefit from the newfound strength of their respective insurers.

Bargaining plays a major role in the pharmaceutical market, where oligopolistic insurers negotiate with oligopolistic pharmacies over the prices of drugs produced by both competitive and monopolistic manufacturers. The upstream and downstream prices of drugs are determined by negotiations among these various parties, who do not simply name a uniform linear price. Rather, prices are negotiated firm-by-firm and drug-by-drug. Conventional wisdom holds that increases in insurers' enrollment better enable them to extract lower prices from drug manufacturers and retail pharmacies, since the failure to come to terms with a larger insurer leads to larger losses of volume. If true, competition among private insurers might then force savings to be passed downstream to consumers. While this belief is popular, economic theory remains ambiguous on these relationships, as we illustrate.

We use pharmacy claims data from a large national retail pharmacy chain that reports the drug prices negotiated between the pharmacy and every insurer with whom it contracts. An attractive feature of our approach is the absence of ex post rebates in agreements between pharmacies and insurers, making negotiated pharmacy prices readily observable and transparent.[3] Moreover, economic theory suggests that, when pharmacies and manufacturers are exposed to the same change in insurers' buying power, the profits and markups of both will move in the same direction. The only exception to this result occurs when one side or the other has no

[3] Negotiations between insurers and pharmaceutical firms offer a second setting in which to test how insurer market power affects bargaining outcomes. However, insurer-manufacturer negotiations typically involve complex pricing arrangements that include upfront pricing terms, or ex post rebates contingent on volume and other factors (Levy, 1999). And despite the policy importance of evaluating the rebates negotiated by manufacturers, the Centers for Medicare and Medicaid Services (CMS) has proscribed the release of this data, which are similarly unavailable from private data vendors. It is thus difficult to measure directly the effect of market power on price negotiations with manufacturers.

market power; in this case, profits and markups remain at zero for the competitive side of the marketplace. This pair of theoretical results allows us to translate impacts on pharmacy profits into implications for manufacturer profits. This strategy for indirect inference is of particular value, since true manufacturer prices, net of rebates, are almost never observed by researchers.

We find that insurers with larger enrollment increases are able to negotiate lower drug prices, and that all negotiated pharmacy price declines associated with the implementation of Part D translate into higher enrollment, rather than higher insurer profits.[4] Enrolling an additional 100,000 Part D beneficiaries enables an insurer to negotiate 2.5-percent lower prices on average. Our evidence suggests that most of the savings negotiated by insurers are, on the margin, passed on to enrollees as lower premiums. These results do not account for savings from improved bargaining power in negotiations with drug manufacturers, and thus provide a lower bound of the enrollment effect on *total* drug costs.

We also estimate the effect of insurer market power on unit-profits earned by the pharmacy, since negotiations over profits, rather than prices, go to the heart of the bilateral bargaining over rents. We find that enrollment increases of 100,000 enable insurers to bargain down pharmacy unit-profits by an average of 5-percent for all drugs. The correlated pharmacy and manufacturer mark-ups implied by the bargaining model imply that this is also the enrollment effect on the *total* cost of drugs. Notably, for generic drugs and branded drugs with therapeutic substitutes, enrollment increases of 100,000 enable insurers to drive down pharmacy unit-profits by 7 to 9 percent. However, the estimated enrollment elasticity for non-competitively supplied branded drugs, which account for roughly 50-percent of all US expenditures on pharmaceuticals, is close to zero. Taken together, these results suggest that insurers, through the threat of network exclusion, effectively use larger enrollment to extract rents from pharmacies for competitively supplied drugs. However, insurers have little ability to leverage enrollment in price negotiations for drugs that have few substitutes. For these drugs, manufacturers appear to retain a chokehold on all the rents, in spite of increases in insurer enrollment. Neither pharmacies nor insurers appear able to credibly threaten manufacturers with network or formulary exclusion for such drugs.

[4] Duggan and Scott-Morton (2008) find that Part D led to decreases in the average price of drugs sold by manufacturers, calculated as changes in total manufacturer drug revenues divided by total sales volume sold to wholesalers, by drug. The aggregate impacts of Part D reported by Duggan and Scott-Morton (2008) are consistent with our findings on price reductions from our insurer-drug level analysis.

When achievable, decreases in retail prices negotiated by insurers may produce welfare gains for all enrollees of an insurer, not just the Part D recipients. This makes possible an external effect of Part D on the rest of the population. Indeed, we find that increased Part D enrollment leads to lower drug costs for the non-elderly commercially enrolled, with greater reductions in cost going to enrollees of insurers that experience larger increases in Part D enrollment. A Part D enrollment increase of 100,000 enables insurers to negotiate nearly two-percent lower pharmacy drug prices in the commercial market. Hence, on the margin, administering Medicare drug insurance under the umbrella of private insurers has both a direct benefit—e.g., effects on drug utilization, as found by Lichtenberg and Sun (2007), Yin *et al* (2008), Duggan and Scott-Morton (2008) and Ketcham and Simon (2008)—and an *indirect external* benefit for insured outside of the Part D program. Notably, insurance externalities of this sort would be forgone in any stand-alone Part D government purchasing model.

Finally, we use our estimated elasticities to explore the impact of altering the contracting model employed by CMS so as to achieve modest insurer consolidation. We estimate that increasing enrollment by 70,000 per insurer—roughly equivalent to reducing the number of insurers in the Part D market by one-third, in line with a number of general proposals aimed at reducing the number of plans and insurers—would reduce federal expenditures by 1.75 to 3.5 percent (equivalent to $500 million to $1 billion in 2009) and reduce consumer premiums by the same percent. A premium decline of this size is expected to increase enrollment by 260,000 to 520,000 seniors. This out-of-sample analysis holds constant the current distribution of insurer costs, and identifies only the pure bargaining effect of consolidating insurer enrollment. A Medicare Part D contracting policy that increases both insurer bargaining power *and* selectively awards contracts to low-cost insurers would stand to lower program costs and increase enrollment by even more. Our results suggest that a small number of low-cost private insurers would command the lowest Part D drug prices. However, extensive insurer consolidation may lead to anti-competitive pricing in which insurers extract rents in the downstream insurer-enrollee market (Dafny 2008). Significantly, the estimated cost declines largely represent a redistribution of rents from retailers and generic manufacturers to enrollees; rents earned by manufacturers on non-competitively supplied drugs (and hence, dynamic incentives to innovate) are less affected.

The paper proceeds as follows: Section 2 discusses the MMA, features of the drug market, and presents a simple Nash-bargaining model that describes how enrollment may impact negotiations over rents. Section 3 lays out the empirical strategy for estimating how enrollment affects pharmacy prices negotiated by individual insurers. Section 4 reports results of the empirical analyses. Policy implications, including our out-of-sample estimation of the impact of hypothetical Part D contracting policies, are reported in Section 5. Section 6 concludes.

2. Model of the Medicare Part D Prescription Drug Market

2.1 Background on the Pharmaceutical Market and the MMA

Medicare outpatient prescription drug coverage was established by the 2003 Medicare Modernization Act (MMA) through the creation of the Part D drug benefit. The federal subsidies required to finance the program are significant, and have led to recent work examining how the program has impacted pharmaceutical profitability (Frank and Newhouse, 2008; Friedman 2009). The high public cost of the MMA, and concerns over its impact on Medicare's long-term sustainability, have drawn attention to the Medicare Part D drug purchasing model.

Under the MMA, the government contracts with private insurers to administer drug plans. As a consequence, the responsibility of negotiating pharmacy drug prices and manufacturer rebates is left up to individual private insurers. The motivation behind this model was the desire to exploit the bargaining power of large private insurers and pharmacy benefit managers (PBMs). Conventional wisdom holds that profit incentives encourage these competing entities to leverage their enrollment (through sophisticated formulary design, or the threat of leaving a pharmacy network) to bargain down prices. These arguments notwithstanding, the reliance on private purchasing entities to bargain over prices has been the subject of ongoing controversy. Those opposing the private purchasing model believe that a single government Part D purchaser could obtain lower prices and pass more of the savings to consumers than private insurers and PBMs.

The purchasing model is summarized in Figure 1. The black lines follow the flow of drugs; the dotted lines follow cash transfers and reimbursements. From the perspective of drug manufacturers, revenues are earned by selling drugs to wholesalers or directly to retail pharmacies at a price negotiated between each retailer and each manufacturer. Manufacturers also negotiate rebates to insurers (private insurers, government agencies and PBMs) in exchange

for inclusion or preferential tiering of their drugs in the formularies of insurers. Rebates are negotiated in one-on-one settings between individual insurers and manufacturers.

Similarly, pharmacies negotiate with individual insurers over the amount they are to be paid when they dispense prescriptions for an insurer's enrollees. These negotiations are also done in a bilateral, take-it-or-leave-it, manner. How the negotiated payment to the pharmacy is then split between enrollee and insurer depends on the specific copayment and deductible architecture of the enrollee's insurance plan.

2.2 Theoretical Model

We summarize and illustrate several pieces of intuition in a simple and conventional model of Nash-bargaining. Loosely speaking, optimal decision-making in the context of Nash-bargaining can be broken down into two stages. First, quantities are set so as to maximize the total amount of consumer surplus available for extraction. The various firms then bargain over the total surplus, according to their negotiating leverage. As a result, growth in surplus will tend to increase profits for all parties with market power. Put differently, the markups charged by firms upstream and downstream will all tend to be positively correlated with the total amount of available surplus. We illustrate this fairly general intuition with a very simple Nash-bargaining model.

At the same time, we illustrate why the impact of insurer size has an ambiguous effect. Indeed, even in this stylized and highly simplified model, increases in insurer size can either increase or decrease prices paid by the insurer. Conceptually, the negotiating leverage of one side depends on its own contribution to the surplus available for extraction. Therefore, changes in the size of a buyer have ambiguous effects on negotiating leverage, depending on the curvature of the supplier's surplus function—a general result derived in previous studies (Stole and Zweibel, 1996; Chipty and Snyder, 1999). For instance, if the seller's surplus function is convex in quantity, a larger buyer generates less surplus per unit sold, on the margin, than a smaller buyer. In this case, increases in size reduce a buyer's negotiating leverage. However, the opposite is true when the surplus function is concave.

We consider a three-way Nash-bargaining model, similar in form and spirit to Chipty and Snyder (1999). A monopolistic manufacturer with varying degrees of market power bargains with a monopolistic pharmacy to set the upstream price of drugs. Downstream, the pharmacy

bargains with a set of insurers. For a given drug, pharmacy profit consists of payments received from n payers, $\sum_{i=1}^{n}\tau_i$, net of the lump-sum transfer T, payable by the pharmacy to the manufacturer, for sale of Q units of a given drug. In general, the payments will depend on the total quantity provided. In addition, the pharmacy may derive other benefits from selling Q units of drugs. For instance, drug sales may drive traffic to stores and produce sales of other merchandise. The net return to such activity is represented by $G(Q)$. In sum, pharmacy profits are given by $G(Q)+\sum_{i=1}^{n}\tau_i(Q)-T$.

Profits of the manufacturer are given by $T-\sum_{i=1}^{n}r_i(Q)-C(Q)$, where T is the lump-sum pharmacy transfer, $\sum_{i=1}^{n}r_i(Q)$ the total lump-sum rebates paid to insurers as a function of aggregate quantity, and $C(Q)$ the cost of manufacturing and selling the drug.

2.2.1 *Upstream Negotiation and Correlated Markups*

The outcome of the bilateral negotiation between the manufacturer and the pharmacy maximizes the Nash product:

$$\max_{Q,T}\left(T-\sum_{i=1}^{n}r_i(Q)-C(Q)\right)^{\gamma}\left(G(Q)+\sum_{i=1}^{n}\tau_i(Q)-T\right)^{1-\gamma} \quad (1)$$

The exponent γ captures the bargaining power of the manufacturer in negotiations over lump-sum transfers for a particular drug. It can be interpreted as the share of incremental surplus appropriated by the manufacturer.[5] For instance, when $\gamma=0.75$, the manufacturer will appropriate three-quarters of the total social surplus generated by trade with a particular pharmacy. The polar case $\gamma=1$ is one of complete manufacturer market power, where it sells a

[5] This parameter is the focus of Ellison and Snyder (2008) who show empirically that the wholesale price of an antibiotic negotiated by manufacturers and pharmacies depends on the substitutability of that antibiotic. Another way to capture bargaining power in this negotiation is to explicitly model the pharmacy's threat point in the expression of its surplus. The threat of non-cooperation comes from a) the legal right of the pharmacy to steer demand away from one drug to a therapeutic equivalent drug; and b) the pharmacy's discretion over carrying a given drug at the risk of losing customers to competing pharmacies. Modeling bargaining power in this way generates the same qualitative results for correlated mark-ups and the impact of increased insurer size. Similarly, exponents in the Nash product could be included to capture varying degrees of bargaining power in the negotiation between manufacture and insurers. For the purposes of this model, we can capture market power of a manufacturer through the manufacturer-pharmacy negotiation, although it is trivial to add Nash exponents in the manufacturer-insurer negotiation as well.

drug that faces no competition from either perfect or imperfect within-therapeutic class substitutes. The opposite case $\gamma = 0$ obtains when the manufacturer produces a drug (e.g., a generic) that faces competition from perfect substitutes. This problem has the first-order conditions:

$$
\begin{aligned}
& C'(Q) + \sum_{i=1}^{n} r_i'(Q) = G'(Q) + \sum_{i=1}^{n} \tau_i'(Q) \\
& T = \gamma G(Q) + (1-\gamma)C(Q) + (1-\gamma)\sum_{i=1}^{n} r_i + \gamma \sum_{i=1}^{n} \tau_i(Q)
\end{aligned} \tag{2}
$$

Substituting the expression for the equilibrium pharmacy transfer into the two surplus functions gives expressions for the profits of the manufacturer and pharmacy, as a function of aggregate quantity:

$$
\begin{aligned}
& \Pi_M(Q) = \gamma\left(G(Q) - C(Q) - \sum_{i=1}^{n} r_i(Q) + \sum_{i=1}^{n} \tau_i(Q) \right) \\
& \Pi_P(Q) = (1-\gamma)\left(G(Q) - C(Q) - \sum_{i=1}^{n} r_i(Q) + \sum_{i=1}^{n} \tau_i(Q) \right).
\end{aligned} \tag{3}
$$

These expressions illustrate two points important for evaluating the empirical analysis. First, changes in pharmacy profits (Π_P) are correlated with manufacturer profits (Π_M). Intuitively, firms with market power are bargaining over a fixed amount of surplus. Changes in that surplus may not be evenly divided, but will tend to raise the rents earned by each. Note that from equation 3, a literal interpretation of the model would suggest that any change in *log profits* will be identical for both the manufacturer and the retail pharmacy.

Second, the market power of the pharmacy *vis-à-vis* the manufacturer plays an important role in determining the size of any impact on pharmacy markups. When pharmacies have little market power—that is, when $1-\gamma$ is small—a given change in total upstream surplus will have a smaller impact on their profits. We find evidence for both these results in our empirical analysis.

2.2.2 *Downstream Negotiation and the Impact of Insurer Enrollment*

Based on the solution to the upstream bargaining problem, the pharmacy bargains simultaneously downstream with each payer i. The outcome of each negotiation is a quantity and lump-sum transfer, (q_i, τ_i). Under the Nash framework, each payer believes that all other

payers are playing optimally, and that it is the marginal payer in the negotiations.[6] The solution to the negotiation maximizes the product of $\Pi_P(Q)$ and the surplus of the payer. Based on the expression for $\Pi_P(Q)$ from above, this can be written as:

(4)

$$\max_{q_i,\tau_i}\left((1-\gamma)\left[\left(G(q_i+\sum_{j\neq i}q_j^*)-C(q_i+\sum_{j\neq i}q_j^*)-(r_i+\sum_{j\neq i}r_j)+(\tau_i+\sum_{j\neq i}\tau_j^*)\right)-\left(G(\sum_{j\neq i}q_j^*)-C(\sum_{j\neq i}q_j^*)-\sum_{j\neq i}r_j+\sum_{j\neq i}\tau_j^*\right)\right]\right)\left(u(q_i)-\tau_i+r_i\right)$$

This problem has the following first-order conditions:

(5)

$$u'(q_i)=-G'(q_i+\sum_{j\neq i}q_j^*)+C'(q_i+\sum_{j\neq i}q_j^*)$$

$$(\tau_i-r_i)=\frac{1}{2}\left[u(q_i)-\left(G(q_i+\sum_{j\neq i}q_j^*)-G(\sum_{j\neq i}q_j^*)\right)+\left(C(q_i+\sum_{j\neq i}q_j^*)-C(\sum_{j\neq i}q_j^*)\right)\right]$$

The manufacturer bargains separately but simultaneously with each payer i. The outcome of each negotiation is a quantity and lump-sum rebate, (q_i, r_i). It is straightforward to show that this problem has first-order conditions identical to those in the pharmacy-payer negotiation, implying that separate expressions for equilibrium τ_i and r_i cannot be derived.

There are a number of ways to conceptualize an increase in enrollment for a firm. We implement it as an amalgamation of two existing payers, h and i. This procedure most faithfully represents the transition of currently insured patients into a new, publicly funded, insurance scheme. However, it also captures the impact of greater enrollment more generally.

The total gross surplus earned by this combined payer is equal to $v(q_i^m+q_h^m)=u(q_i^m)+u(q_h^m)$, while the total tariff paid by the merged payer is denoted as τ_{hi}, and the rebate received by the merged payer denoted as r_{hi}. The linearity in the combined payer's gross surplus function implies that enrolling in a larger insurer confers no benefit to an insured,

[6] One could enrich this model by specifying it as an extensive-form game in which there is a set of probabilities that other players' negotiations break down. Chipty and Snyder (1999) note that the Nash-bargaining approach leads to a limiting perfect Bayesian equilibrium of the extensive-form game, in which the probability of breakdown approaches zero. Practically speaking, the Nash framework is both simple and likely relevant to the pharmaceutical context, where negotiations rarely break down entirely between the players.

above and beyond any resulting impacts on quantity. The combined payer bargains with the pharmacy according to:

$$(6)\qquad \max_{q_i,q_h,\tau_{ih}} \left(\left(G(q_i^m + q_h^m + \sum_{j\neq i,h} q_j^{m*}) - C(q_i^m + q_h^m + \sum_{j\neq i,h} q_j^{m*}) - (r_{ih} + \sum_{j\neq i,h} r_j^m) + (\tau_{ih} + \sum_{j\neq i,h} \tau_j^{m*}) \right) - \left(G(\sum_{j\neq i,h} q_j^{m*}) - C(\sum_{j\neq i,h} q_j^{m*}) - \sum_{j\neq i,h} r_j^m + \sum_{j\neq i,h} \tau_j^{m*} \right) \right) * \left(u(q_i^m) + u(q_h^m) - \tau_{ih} + r_{ih} \right)$$

This problem has the first-order conditions:

$$(7)\qquad \begin{aligned} & u'(q_i^m) = u'(q_h^m) = C'(q_i^m + q_h^m + \sum_{j\neq i,h} q_j^m) - G'(q_i^m + q_h^m + \sum_{j\neq i,h} q_j^m) \\ & (\tau_{ih} - r_{ih}) = \frac{1}{2}\left[u(q_i^m) + u(q_h^m) - \left(G(q_i^m + q_h^m + \sum_{j\neq i} q_j^{m*}) - G(\sum_{j\neq i} q_j^{m*}) \right) + \left(C(q_i^m + q_h^m + \sum_{j\neq i} q_j^{m*}) - C(\sum_{j\neq i} q_j^{m*}) \right) \right] \end{aligned}$$

The impact of the merger on the division of rents is ambiguous. The net price paid by payers strictly falls if $C(Q) - G(Q)$ is strictly convex in Q. This result resembles the convexity condition derived by Chipty and Snyder (1999) in the context of a single seller.

To appreciate the importance of curvature in the surplus function, observe first that, for all payers k, the first-order conditions for q_k^m are identical to the corresponding conditions for q_k^s. Therefore, it follows that $q_k^m = q_k^s$, for all k. This allows us to suppress the superscripts on the quantity variables for the rest of this section. For convenience, define $J(Q) \equiv C(Q) - G(Q)$. Exploiting this result, we can write the following:

$$(8)\qquad \begin{aligned} & (\tau_{ih} - r_{ih}) - [(\tau_i - r_i) + (\tau_h - r_h)] = \\ & \frac{1}{2}\{[J(Q) - J(Q - q_i - q_h)] - [(J(Q) - J(Q - q_i)) + (J(Q) - J(Q - q_h))]\} \end{aligned}$$

The expression above is strictly negative if J is strictly convex.

This result has a number of corollaries, which make clear the theoretical ambiguity of this prediction. First, payer amalgamation lowers prices if G is strictly concave, and C is weakly convex. Alternatively, if G and C are linear, amalgamation has no impact on prices. Finally, if

J is strictly concave—e.g., due to increasing returns in the manufacture of pharmaceuticals—payer amalgamation actually leads to higher net prices paid by insurers.

3. Data and Empirical Strategy

We empirically examine the impact of insurer enrollment on pharmacy prices and profits, along with insurer premiums. These findings, coupled with the theoretical insights from above, are used to draw inferences about impacts on consumer welfare and the distribution of rents among manufacturers, pharmacies, insurers and the public.

3.1 Data

Data on prescription drug utilization and expenditures come from a national retail pharmacy chain. As of January 1, 2006, when Medicare Part D was implemented, the pharmacy chain had retail presence in 45 US states; and prescriptions filled at its pharmacies account for approximately one-fourth of the US prescription market.

We obtained all pharmacy claims for a five percent random sample of unique pharmacy customers over the age of 60. For these individuals, we obtained data on claims for every prescription filled at the chain between September 1, 2004 and April 31, 2007. Each claim reports the National Drug Code (NDC) of the prescription filled, its therapeutic class, pill quantity, number of treatment days, and date dispensed, identification of the third-party payer, out-of-pocket and third-party payer expenditures, and the address of the pharmacy where the claim took place. The claims data also contain information on subjects' demographic characteristics (date of birth, sex, language preference, and zip code of residence).

The pharmacy claims data report drug utilization that is largely consistent with that reported in the Medical Expenditure Panel Survey (MEPS) for the same period. Table 1 lists the top 25 drugs by pharmacy revenues utilized by seniors between 2004 and 2006. The corresponding rank among drugs utilized by seniors in the MEPS between 2004 and 2005 is also reported. For the present study, nationally representative data are not necessary. The more important need is to observe claims for the same drug in each insurer-market cell across time. Nevertheless, the drug ranking in the pharmacy claims tracks the MEPS rankings closely. Notable exceptions in the MEPS are listed in the table notes, and include drugs that are

predominantly administered by physicians and thus under-represented in out-patient retail pharmacy claims.

With these data, we are able to determine the drug prices negotiated between the pharmacy and each insurer for every drug that appears in the claims. Negotiated pharmacy prices vary considerably across insurers. Figure 2A and 2B show the distribution of drug prices reimbursed to the pharmacy relative to the average price for that drug in September 2005, for all branded and all generic drugs, respectively. Variation in pharmacy drug prices primarily reflects variation in prices negotiated across insurers.[7] The range in negotiated prices for all branded drugs is roughly equivalent to 10-percent above and below the average negotiated price. For generics, however, the range is much wider, ranging from 75-percent below to 280-percent above the average negotiated price. The difference in the range of negotiated prices between branded and generic drugs is consistent with lower acquisition costs of competitively supplied drugs, coupled with variation in the pharmacy's market power with respect to each insurer. This leads to greater variance in the mark-ups paid by insurers to pharmacies. The empirical analysis to follow examines whether differences in enrollment growth across insurers explains variation in changes in negotiated drug prices at this national retail pharmacy.

We observe in the data claims from most large insurers that participate in Medicare Part D. There are two reasons why a Part D insurer may not appear in our sample of claims: the pharmacy did not contract with the insurer; or claims from the insurer are not sampled from the full pharmacy claims. For both these reasons, smaller insurers are less likely to appear in the claims data. Table 2 shows the distribution of Part D insurers represented in our sample of pharmacy claims according to their 2007 Part D enrollment. In total, we observe 89 Part D insurers in the claims data. The columns parse the insurer universe by Part D enrollment. Note that the distribution of Part D enrollment by insurer is highly skewed. For instance, the median Part D insurer enrolls less than 6,400 Part D seniors, while the 90th percentile Part D insurer has more than 20-times greater Part D enrollment.

Data on enrollment, premiums and benefit design for Part D and Medicare Advantage plans come from the Centers for Medicare and Medicaid Services (CMS). Plan-level information

[7] There is also slight geographic variation in pharmacy prices within insurer. This variation reflects differences in factor prices across markets or differences in delivery costs of drugs from manufacturers or wholesalers to retail pharmacy stores.

also identifies the sponsoring insurance firm, so that enrollment can be aggregated to the insurer. Premium information is published annually, and corresponds to end-of-year open-enrollment premium pricing for coverage beginning the following year. Enrollment and Part D Landscape files are publicly available on the CMS website.

3.2 Empirical Strategy

3.2.1 *Insurer's Drug Cost Equation*

To test how enrollment affects prices and profits, we exploit the introduction of Part D, which brought about nearly 25 million new insured individuals to the rolls of existing insurers. We test whether insurers that experienced greater enrollment increases negotiated lower pharmacy drug prices.

Ideally, we would like to estimate how *total* insurer enrollment affects negotiated pharmacy drug prices. However, we do not have data on each insurer's total book of business; instead, we have Part D enrollment data from CMS. Therefore, we exploit the relatively large increases in each insurer's enrollment associated with the introduction of Part D, and take increases in insurers' Part D enrollment to be changes in insurers' total enrollment. This approximation creates a potential errors-in-variables problem, discussed below. We estimate the following cost equation in first differences:

$$\Delta \ln(price_{d,f,m,t}) = \alpha + \beta \Delta Enrollment_{f,t} + \gamma \Delta X_{d,f,m,t} + \varepsilon_{d,f,m,t} \quad (9)$$

The dependent variable is the percent change in the log price per pill[8] over all prescriptions of drug *d* filled by enrollees of insurer *f* in market *m* between period *t* and *t-1*.[9] We define periods to be a half-year in length, where the second half of 2005 is the base year in each specification.

[8] While "pills" may represent larger or smaller units of treatment, our study of changes in the log unit price eliminates the need for consistent units across drugs.

[9] Insurer-pharmacy negotiations occur at the national level; nevertheless the unit of observation is the insurer-drug-market, rather than the insurer-drug. In some cases, insurers will inflate/deflate negotiated prices in certain markets (i.e. states) to reflect local factor costs. Changes over time in the average price of a drug at the insurer-drug level may inadvertently capture changes in the geographic distribution of drugs observed in the claims at the national level due to sampling variation. We avoid this confound by directly setting the unit of observation to be the insurer-drug-market. The first-difference analysis makes use of claims that appear in the same drug-insurer-market cell in both a pre-and post-Part D study period. For common drugs, the claims data produce few missing cells. In general, the claims data generate an unbalanced panel of drug prices at the level of the drug-insurer-market.

Both the first and second halves of 2006 are used as the post-Part D-implementation comparison period in order to investigate the timing of any effect of enrollment on bargaining. Negotiated prices in the second half of 2004 are compared to prices in the second half of 2005 in our falsification tests, to assess whether there are any pre-existing trends that might contaminate our estimation. The key independent variable is the set of changes in each insurer's Part D enrollment. This serves as a proxy for changes in its total enrollment.

The vector of covariates, X, include a measure of each insurer's exposure to the pharmacy[10] and the average wholesale price of the drug.[11] Note that the first-difference specification necessarily differences out time-invariant drug, insurer, and market-level characteristics. Use of enrollment changes, rather than log changes, generates a semi-elasticity estimate that captures the average effect of enrollment increases on negotiated prices across insurers of all sizes.

It is worth reiterating that the enrollment elasticity captures the change in the price paid to the pharmacy, and not literally the change in the price paid by the insurer, in response to enrollment changes. However, Nash-bargaining between pharmacy and manufacturer induces correlation between the changes in pharmacy and manufacturer *profits* that result from changes in insurer bargaining power.

3.2.2 Identification of the Cost Equation

A key concern in estimating equation (9) is the potential endogeneity of the enrollment variable to the negotiated pharmacy drug prices. These prices represent the marginal cost of drug utilization to enrollees in the deductible and in any coverage gap, and serve as the base drug price in co-insurance corridors. Consequently, enrollment may respond directly to pharmacy drug prices, a behavior that would bias β_1 away from zero. Recent studies, however, suggest that this bias is unlikely to be large. Seniors' Part D plan choices often do not adequately account for

[10] Theory suggests that greater exposure to the pharmacy increases the pharmacy's market power in bilateral negotiations. Each insurer's exposure to the pharmacy is calculated as the weighted average of the pharmacy's market share in markets where the insurer is present, where market weights reflect that each market's contribution to the insurer's total commercial business. Data on pharmacy market share was obtained from the Chain Store Guide, which reports annual sales and store counts of all pharmacies (total and by-chain) for local geographies in the US, for 2005 through 2008.

[11] We also include a measure of average number of pills sold per prescription for a given drug d, insurer f and market m. Recall that the dependent variable is the average price per pill over all filled prescriptions in each cell. Given that prescriptions contain any number of pills, this measure controls for changes in the average number of pills per prescription over time which may affect per pill prices through bulk-rate pricing.

the marginal cost of drug utilization; instead, seniors appear to weight plan premiums and non-monetary plan characteristics such as brand name heavily when choosing plans (Kling et al, 2008; Abaluck and Gruber, 2009). More threatening is the possibility that lower drug costs filter down as lower Part D plan premiums, which may encourage larger Part D enrollment. This possibility would result in estimates of β_1 that are biased away from zero. However, note that premiums are set in the July *preceding* the coverage year. Hence, while variation in premiums may reflect level differences in negotiated drug costs across insurers, bias occurs only if premium variation reflects differences in *anticipated changes* in negotiated drug prices—a mechanism for which we find little evidence.

Alternatively, sicker patients (and hence, those with greater expenditure risk) may be more sensitive to the marginal cost of drugs. Adverse selection into plans with low marginal cost of drugs may lead to higher premiums and lower total enrollment, resulting in a downward bias in the estimate of β_1. Further, as mentioned earlier, we do not observe changes in insurers' total enrollment; we only observe changes in their Part D enrollment. Classical measurement error in our proxy for changes in total enrollment will also lead to a bias in our estimate of β_1.

To address these potential sources of biases, we implement an instrumental variables strategy that exploits two predictors of insurers' initial 2006 Part D enrollment: each insurer's total potential Part D enrollment; and each insurer's tendency to price Part D plan premiums at a mark-up or discount—an insurer-level measure we call their *adjusted premium*. Intuitively, insurers may find themselves to be in stronger or weaker positions to capture Part D enrollees, purely as a function of their geographic presence several years prior to the implementation of Part D. This idea underlies the first instrument. In addition, some insurers may make conscious business decisions to pursue greater or less Part D market share, as measured in the second instrument.

These two instruments imply the following first-stage equation, which precedes the cost-enrollment equation:

$$\Delta Enrollment_{f,t} = \gamma_0 + \gamma_1 PotentialPartDEnrollment_f + \gamma_2 Adj\_Premiums_{f,t} + \Gamma X_{f,t} + \eta_{f,t} \quad (10)$$

An insurer's *potential Part D enrollment* is simply the count of seniors without private health insurance in 2005 (and hence, without prescription drug coverage) within markets (i.e. states) in

which a given insurer is present in 2005, the year prior to Part D implementation.[12] That is, we define *Potential Part D Enrollment* as:

$$(11) \qquad Potential\ Part\ D\ Enrollment_f \equiv \sum_m (Seniors\ w/o\ PHI_{m,t=2005} \cdot 1[insurer_f\ in\ m]_{t=2005})$$

The intuition is that, due to labor and insurer capacity constraints, or state-level institutional or knowledge barriers, entry into new insurance markets is not costless. Hence, commercial underwriting presence in a state prior to Part D allows for easier entry into that state's Part D market. Indeed, among Part D insurers, there is little difference between their 2006 Part D state penetration and their 2004 commercial presence. Commercial presence in prior to 2006 is a strong geographic predictor of entry in the Part D market.

Naturally, insurers with large potential Part D enrollment are on average likely to be large insurers with national commercial presence. A validity concern results, if larger insurers are more likely to be present in more markets, *and* more likely to experience systematically different price changes. To test this hypothesis, we estimated the relationship between firm size and changes in drug prices, prior to Part D implementation. We found no relationship between the two quantities, as detailed in Appendix Table 1.

The second instrument captures pricing variation that is unrelated to costs. Firms may under- or over-price their Part D benefit packages, either intentionally or unintentionally. Intentionally, they may want to pursue Part D market share aggressively, or to avoid it. Unintentionally mistaken expectations could also be a source of under- or over-pricing. To encapsulate this idea, we use as an instrument the insurer's *adjusted premium,* which is a measure of its relative over- or under-pricing of the standard benefit, compared to the average premium of identical or actuarially equivalent plans sold in the same market.[13] Specifically, the instrument is constructed from the insurer fixed-effects in the following premium analysis:

[12] This count includes seniors enrolled in Medicaid prior to Part D implementation. While seniors eligible for both Medicaid and Medicare received their drug coverage through state Medicaids prior to Part D, they now are covered through private Part D insurer plans, and thus constitute a large part of the increase in enrollment in private insurance rolls as a result of Part D implementation.

[13] An advantageous feature of the Part D market is that CMS defines a standard (minimum benefits) coverage plan. The majority of Part D plans offered by private insurers are either standard plans, are plans that are actuarially equivalent to the standard plan—plans that are virtually identical to the standard design, however with small (and observable) differences in deductibles, co-payment design and formularies. Equation (12) is restricted to standard and actuarially equivalent plans offered in the *same* market, greatly reducing any source of bias due to unobserved plan characteristics. So-called "premium" plans (plans that offer greater levels of coverage set by the insurer, but are priced higher than standard plans) are omitted from estimation of equation (12). CMS data on plan

(12) $$\ln(premiums_{p,f,m}) = \alpha + X_{p,f,m}\beta + \lambda \Delta BasketCost_f + \delta_f + \theta_m + \varepsilon_{p,f,m}.$$

We regress the log premium of plan *p* offered by insurer *f* in market *m* on plan characteristics, *X*, and indicators for each insurer. In equation (12), markets are demarcated by CMS-defined region. The region indicator variable, θ_m, restricts estimation of equation (12) to actuarially equivalent plans offered in the *same* CMS market. Next, we want to eliminate differences in premiums that are driven by anticipated changes in insurers' drug costs. We use the pharmacy claims data to estimate changes in the negotiated cost of drugs for insurer, calculated as changes in the cost of a common basket of drugs, $\Delta BasketCost$, between mid-year 2005 and the first half of 2006. [14] This measure does not capture administrative costs or cost reductions related to rebates. However it allows us to net out realized changes in retail drug costs, which account for the bulk of costs to a prescription drug insurer.

The estimated insurer fixed-effects, $\hat{\delta}_f$, capture all insurer-specific sources of premium pricing differences across insurers, net of changes in underlying cost. $\hat{\delta}_f$ defines our *adjusted premium* instrument, which can be usefully decomposed as:

(13) $$\hat{\delta}_f = \left(\gamma_f^{Cost} + \gamma_f^{\text{Prem}Strategy} + \upsilon_f^{\text{Unrealized}\Delta Cost}\right) + \varepsilon_f$$

Conceptually, the insurer fixed-effects capture pre-Part D differences in insurers' costs, which we define as γ_f^{Cost}, and differences in insurers' premium pricing strategy to gain Part D market share, which we define as $\gamma_f^{PremStrategy}$. Both of these are unlikely to be correlated with *changes* in drug costs, except through the effect of premiums on enrollment. The last component of $\hat{\delta}$ is unrealized changes in costs, $\upsilon_f^{Unrealized\ \Delta Cost}$. Unrealized anticipated changes to negotiated insurer costs can be interpreted as idiosyncratic mispricing, which is arguably unrelated to actual changes in the price of drugs and is hence desirable variation. However, any *realized* changes to costs that are anticipated by insurers are absorbed by the $\lambda \Delta BasketCost_f$

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design and premiums clearly identify plan type (standard, actuarially equivalent, or premium), and plan design. This is in large part due to the fact that CMS reimbursements to private insurer for Part D coverage is tied to plan type and benefit design, which necessitates development of a clear typology of all Part D plans in the market.

[14] The basket comprises the top 1000 expenditure-weighted drugs from the national retail pharmacy claims data. Each drug's weight in the basket is pegged to drug-specific expenditure weight estimated from the 2005 and 2006 pharmacy claims. Cost estimates of this common basket of drugs are also used in premium pass-through analyses to follow.

term in the regression.[15] In practice, including or excluding the basket cost term has a negligible impact on the instrument $\hat{\delta}_f$ or the associated IV results. This suggests that anticipated price changes do not play a substantial role in pricing above or below industry norms.

Figure 3 shows the distribution of the *adjusted premium* variable for the 34 insurers for which this instrument can be calculated. There appears to be a relatively tight bell-shaped distribution of the adjusted premium measure with the exception of one insurer, Humana, which is visibly atypical in the degree to which it under-prices its Part D plans. On average, this insurer prices plan premiums at a 70-percent discount relative to the average premiums for identical plans sold in the same market. The finding is consistent with a widely publicized business strategy to rapidly gain Part D market share. To the extent that other insurers engage in similar, but less obvious, pricing strategies, the *adjusted premium* instrument should capture its effect on Part D enrollment.

Note that observations in the enrollment elasticity analysis are based on pharmacy claims averaged over drug-insurer-state cells. The first-difference estimation framework outlined above requires repeated claims for each drug-insurer-state cell. 74 of the 89 Part D insurers observed in the claims data have repeated claims for at least one insurer-drug-market cell. Further, 34 of these insurers offer at least one Part D plan (PDP), in addition to any plans offered through employer-based retirement coverage or Medicare Advantage plans. Hence, the main analyses are based on claims data from the 34 private insurers for which we have stand-alone Part D plan premium data; these are required for the construction of the *adjusted premium* instrument.[16] Results from estimating equation (9) using OLS on all 74 insurers are reported in Appendix Table 2. The sample of drugs includes the top 1000, as ranked by total expenditures in the pharmacy claims.

[15] The peculiarities of the Part D market suggest this component to be small. Insurers are required to set premiums six months prior to the roll-out of Part D plans. For example, 2006 Part D plan premiums are set in July, 2005, as part of each insurer's bid to contract with CMS as a Part D plan provider. The long lag makes it more difficult for insurers to accurately predict future costs. Nevertheless, insurer's may still be pricing premiums under the expectation that, for reasons other than increased Part D enrollment, negotiated drug prices will change (due to, say, anticipating changes in non-Part D commercial enrollment, implementation of a new aggressive negotiation strategy, etc). Note that under-pricing premiums in expectation that negotiated costs will decline *due to* enrollment increases from lower premiums is part of the variation in the insurer fixed-effects that we hope to retain in our *adjusted_premium* instrument.

[16] Only insurers that offer a stand-alone Part D plan are used in the main analyses, as Part D plan premiums are required for the construction of the *adjusted premium* instrument. Small, usually regional, insurers comprise the set of insurers that participate in Medicare Part D but do not offer a stand-alone PDP, and in total account for relatively few drug-insurer-state observations of pharmacy claims.

3.2.3 Insurer Enrollment and Pharmacy Profits

Section 3.2.2 outlined the methodology to estimate the enrollment elasticity of pharmacy drug prices. This elasticity does not account for the enrollment effect on rebate negotiations, which also affect the total cost of drugs. Hence, these elasticities represent a lower bound of the effect of enrollment on the total cost of drugs negotiated by insurers.

The profit model goes more directly to the heart of bargaining power, since firms ultimately bargain over rents, rather than prices. Moreover, changes in the prices of branded versus generic drugs may translate differently into changes in profits. Conventional wisdom suggests that pharmacies earn larger profits on generic drugs, and that profit margins on branded drugs are slimmer. Hence, there may be little room for pharmacies to negotiate prices for branded drugs, particularly as a percentage of the high absolute price of branded drugs. Greater enrollment may give insurers leverage to bargain over profits earned by providers, even if enrollment leads to small percentage changes in the negotiated drug price.

To estimate pharmacy profits, we require data on the acquisition cost of drugs to the pharmacy. In practice, we do not observe the pharmacy's acquisition cost of each drug in the claims data. In order to calculate pharmacy profits, we estimate the pharmacy's acquisition cost per drug using the minimum pharmacy price negotiated across all insurers for a given drug *d*. This methodology is similar to the minimum dependent variable estimator for the unobserved censoring point in Tobit models (Zuehlke, 2003; Carson and Sun, 2007).[17] We calculate:

$$
\begin{aligned}
Cost_{d,t} &= \min_{\forall f}(price_{d,f,t}) \\
\overline{\Pi}_{d,f,m,t} &= price_{d,f,m,t} - Cost_{d,t}
\end{aligned}
\tag{14}
$$

$Cost_{d,t}$ is the per-pill cost of a given drug *d* at time *t.* $\overline{\Pi}_{d,f,t}$ is the profit per-pill earned by the pharmacy for filling the prescription for drug *d* for an enrollee of insurer *f.* We average the profits over all prescriptions for a given drug-insurer-market to construct an average profit per pill over period *t.* Equation (15) estimates changes in log average profits per pill, $\overline{\Pi}_{d,f,t}$, on changes in each insurer's Part D enrollment:

[17] In these models, regression parameters are consistently estimated when the minimum value of the dependent variable is used as an estimate of the unobserved censoring point. While the current setting is not a Tobit, the motivation for the minimum dependent variable estimator is similar, particularly under the assumption that the estimate of the censoring point comes from an ordered statistics that converges to the true value as the number of groups increase (in our case, groups are the number of insurers).

(15) $$\Delta \ln(\overline{\Pi}_{d,f,t}) = \alpha + \beta \Delta Enrollment_{f,t} + \gamma \Delta X_{d,f,m,t} + \varepsilon_{d,f,m,t}.$$

As in equation (9), the analysis is conducted in first-differences, which sweeps out any time-invariant effects of each drug, insurer, and market. Potential endogeneity of enrollment is addressed using the instrumental variables approach discussed in section 3.2.2.

3.2.4 Retained Savings or Pass-through

Given any potential cost savings from increasing market power, we also wish to estimate the extent to which insurer savings are retained as rents or passed on to Medicare and to enrollees. Pass-through to Medicare is mandated by the MMA through end-of-year reconciliation—a process ensuring that federal subsidies to insurers accurately reflect insurers' actual drug costs over the plan-year. Pass-through to enrollees, on the other hand, may occur through lower premiums in the next plan-year.[18] To test whether cost-savings are passed on to enrollees, we estimate the relationship between the drug costs negotiated by insurers and the premiums they charge in the Part D market. Data on Part D plan premiums and benefit designs for 2006 and 2007, the first two years of Part D implementation, come from CMS. The cost of drugs is calculated as the negotiated pharmacy cost of a common basket of drugs. Each drug's weight in the common basket corresponds to its relative expenditure weight in the pharmacy claims. Between-insurer variation in the cost of the drug basket, *BasketCost*, is driven by differences in negotiated pharmacy prices. New plans come into and out of the market between 2006 and 2007. (Changes over time in this *BasketCost* measure are used in the construction of the adjusted premiums instrument, discussed above.) We estimate the pass-through analysis using plan fixed effects, θ_p:

(16) $$premium_{p,f,m,t} = \alpha + \beta_1 BasketCost_{f,t} + X_{p,f,m,t} \cdot \gamma + \tau_t + \theta_p + \varepsilon_{p,f,m,t},$$

The outcome variable, *premium*, is the annual premium for plan *p* offered by firm *f* in market *m* at time *t*. The vector of covariates, *X*, includes plan-level characteristics such as deductible size, whether the plan accepts low-income beneficiaries (and hence, is eligible to receive a per-capita low-income subsidy), and the type of coverage in the coverage gap.

[18] Part D plan insurers do not directly set premiums. Rather, they submit plan bids that reflect expected costs of covering enrollees. Medicare pays each insurer a subsidy equivalent to 74.5-percent of the average across all bids. Premiums are determined as the insurer's bid less the subsidy. Hence, pass-through of insurer savings, to the extent that it occurs, happens through submission of competitive bids that reflect true costs as well as profits.

The way in which insurers are subsidized in the Part D market is relevant for the interpretation of β_1. CMS pays each insurer a per capita subsidy equivalent to 74.5-percent of the average, risk-adjusted cost for covering beneficiaries enrolled in a plan with the standard Part D benefit. The remaining cost, plus any insurer profits, is covered by the premiums charged by insurers. Costs for covering expenditures on benefits exceeding the standard prescribed Part D plan must also be covered by premiums, since these are not subsidized by the government. Hence, on average, for plans offering the standard benefit (and plans that are actuarially equivalent to the standard benefit), a $1 increase in the cost of the basket should be associated with a $0.25 increase in annual premiums, if savings and costs are completely passed on to enrollees.

A key complication for identification arises when one considers the negotiations between insurers and drug manufacturers over rebates. We do not observe the size of rebates; however, the effect of enrollment on pharmacy price negotiations likely affects negotiated manufacturer rebates in the same way. To the extent that rebates are also passed on to enrollees as lower premiums, omission of rebates from equation (16) will bias the coefficient on *BasketCost* away from zero.[19] Hence, an estimate of β_1 that is significantly smaller than 0.25 would suggest little pass-through of savings to enrollees; and complete pass-through would imply an estimate of β_1 that is somewhat larger than 0.25.

4. Results

4.1 Enrollment and Negotiated Drug Prices

Results from equation (9) are reported in Table 3, where standard errors are clustered at the level of the insurer. Column 1 reports OLS estimates of the enrollment effect for the entire sample of branded and generic drugs, on changes in drug prices between the second half of 2005 and the

[19] One possible solution is simply to instrument for *BasketCost* in equation (18).Candidate instruments include factors that shift costs but are unrelated to premium pricing. For example, a measure of each insurer's exposure to the collaborating pharmacy, which is included as a covariate in equation (9), could be used. Increased market share of the pharmacy should improve its bargaining power in the bilateral negotiations with each insurer, which in turn affects negotiated costs. Unfortunately, a change in one pharmacy's market share is necessarily accompanied by decreases (on average) in an insurer's exposure to other pharmacies. The measure of insurers' exposure to the collaborating pharmacy is by definition endogenous. Note that this strategy could be implemented with claims data from *all* pharmacies. *BasketCost* in equation (5) could be calculated as an average cost of an insurer's basket across all pharmacies; this could then be instrumented by a measure of pharmacy market concentration to which each insurer is exposed.

first half of 2006. An increase in the number of Part D enrollees by 100,000 is associated with a decrease in negotiated prices by 0.16-percent, an economically negligible effect. The IV model, in column (2), yields a similar magnitude. Notably, the effect size is depressed due to the influence of one large Part D insurer. Humana, with a Part D enrollment of roughly 5 million, dwarfs even the 90th percentile insurer which enrolls 100,000 seniors. Despite experiencing the largest declines in negotiated costs between 2005 and 2006, in both levels and log terms, its large increase in Part D enrollment flattens the linear relationship between changes in prices and changes in enrollment reported in columns 1 and 4. At this point, we remain agnostic as to whether the influence of Humana represents a non-linear effect for large changes in enrollment, or reflects idiosyncrasies associated with Humana's price negotiations. We report results where a squared enrollment term is included (to capture non-linear effect of changes in enrollment), and report results of a linear specification where observations from Humana are dropped.

Results of the non-linear specifications are reported in columns 2 and 5. The IV results reported in column 5 suggest that an enrollment increase of 100,000 is associated with insurers negotiating roughly 2.5-percent lower pharmacy drug prices. Columns 3 and 6 repeat the linear specification using all insurers except Humana. The IV specification suggest that an extra 100,000 enrollees leads to a 2.23-pecent price reduction—an effect size that is consistent with the results of the squared specification for the range of enrollment increases experienced by virtually all Part D insurers. A few properties of the IV analysis are noteworthy. First, it is impossible to reject the validity of the OLS model, based on a Hausman test. Indeed, the IV point-estimates are quite similar to those from the OLS. This suggests that the reverse causality from drug prices to Part D enrollment may not be playing a quantitatively large role, at least relative to the statistical precision of our data.

Second, the *adjusted premium* instrument seems to be of particular importance for explaining the enrollment of Humana, while the potential enrollment instrument seems important for the other insurers. Including Humana generates first-stage significance for this instrument in column 2. Moreover, in the nonlinear specification with all insurers, the quadratic function of the adjusted premium explains enrollment to a remarkable degree. Humana's outsized change in enrollment appears to be driven by a strategy that priced premiums far below what one would predict, based on either the levels of or changes in their costs. Indeed, this fact is evident in the distribution of the *adjusted premium* measure shown in Figure 3. Humana is unique in the

extremity of its underpricing. In spite of this variability across models, the effect sizes tell reasonably consistent stories, given the influence of each firm in the model. Columns (1) and (4), dominated by the Human enrollees, imply 8-9 percent price breaks for Humana. The nonlinear models in columns (3) and (6) yield price breaks of 5% for Humana. The range of estimates is tighter for the other insurers. For instance, an insurer with Part D enrollment of 100,000 enjoys a 2.2 to 2.5 percent price break according to the linear and nonlinear model in columns 5 and 6., and a 2.2 price decline, in response to enrollment increases.

As discussed in Section 3.2.2, conventional wisdom holds that pharmacies have the market power to place larger percentage mark-ups on generic drugs than branded drugs. The pharmacy's own acquisition cost of branded drugs is close to the monopoly price set by drug manufacturers, potentially leaving little room for pharmacy mark-ups, and little to no price margins for insurers to leverage enrollment to negotiate higher prices. This prediction is borne out in the data. Table 4 reports estimated enrollment effects on pharmacy prices separately for branded and generic drugs. The estimated insurer enrollment effect on negotiated branded drug prices is precisely estimated, but economically small. In contrast, a 100,000 person increase in enrollment allows insurers to negotiate 5.1 to 5.8-percent lower prices for generic drugs.

We repeat the analyses on alternative specifications of the study period as robustness checks. Panel A of Table 5 reports estimated IV enrollment effects on changes in negotiated pharmacy drug prices between the second half of 2005 and the second half of 2006. The results are largely consistent with enrollment effects reported in Tables 4 and 5, suggesting that the enrollment effect persists as expected throughout the year, and are not an artifact of the study period chosen. Another concern is that our chosen time period is capturing insurer-specific trends in negotiated prices (due to business strategy or otherwise) that are correlated with increases in Part D enrollment. The instrumental variables strategy should account for such sources of endogeneity. Nevertheless, we conduct a falsification test where we estimate the enrollment effect on changes in negotiated drug prices between the second half of 2004 and the second half of 2005. Results are reported in Panel B of Table 5. Neither the instrumental variables nor the OLS estimates (not reported) suggest that our main results are explained by long-term trends in price negotiations that happen to be correlated with changes in Part D enrollment.

4.2 Enrollment and Profits

Rather than bargaining over prices, bilateral negotiations may occur over unit profits earned by the pharmacy. This model would suggest that estimated enrollment elasticities may be more comparable across settings. For instance, reductions in the price of expensive branded drugs negotiated by an insurer may represent small absolute decreases, but substantial declines with respect to residual unit drug profits earned by the pharmacy.

Table 6 reports enrollment effects on pharmacy profits-per-pill from estimation of equation (15). Here, as in the enrollment-price analysis, IV estimates for both the linear enrollment and the linear-squared enrollment specifications are larger than the analogous OLS estimates. IV estimates imply that increasing enrollment by 100,000 allows insurers to negotiate away 4.1 to 5.1-percent of profits earned by the pharmacy. We repeat the analysis stratifying the sample by branded and generic drugs. Results are reported in Table 7. We continue to find a strong enrollment effect on generics: enrollment increases of 100,000 allow insurers to bargain away 8.5 to 9.3-percent of pharmacy profits. Somewhat surprisingly, we find a small and statistically insignificant effect of enrollment on unit profits earned by the pharmacy on branded drugs.

Stratifying the analysis according to the competition facing each branded drug reveals why the average enrollment effect for all branded drugs is small. We anticipate less surplus available for division between pharmacy and insurer in cases where manufacturers have greater relative market power. In the extreme case, where manufacturers have total market power, we expect no effect of insurer enrollment on pharmacy prices. Our analysis presumes that the degree of patent protection and therapeutic competition within a class affects the relative market power of the manufacturer, but not the relative market power of the insurer with respect to the pharmacy.

Table 8 stratifies the branded drug sample according to the degree of competition faced by each drug. We define competition to be the number of substitutes for a given branded drug. Two conventional definitions are used: the number of generic drugs for the same compound (e.g., on-patent branded drugs face zero substitutes by this definition); and the number of generic

drugs on the market within the same therapeutic sub-class.[20] Columns 1-4 of Table 8 stratify the sample of branded drugs into those that have zero within-compound substitutes, and those with one or more. For non-competitively manufactured drugs—i.e. on-patent drugs by this definition—the enrollment effect is negative, small in size and statistically insignificant. Notably, this set of drugs accounts for roughly 50-percent of all expenditures on pharmaceuticals in the US. In contrast, for drugs with one or more direct substitutes, the enrollment effect is nearly as large as the enrollment effect estimated for generic drugs. These drugs, when combined with all generic drugs, account for the remaining 50-percent of all US expenditures on pharmaceuticals.

As a robustness check, we use our second measure of the competition based on therapeutic sub-class. Sub-classes provide for a broader categorization than unique compounds, and are able to capture competition from imperfect therapeutic substitutes that treat the same disease. Columns 5-10 of Table 8 repeat the analysis stratifying the sample of branded drugs into terciles based on the number of within-subclass therapeutic competitors faced by each drug. Here too, the enrollment effect for branded drugs facing the least competition is close to zero and statistically insignificant. As the number of substitutes increase, so too does the magnitude of the estimated enrollment effect on unit profits earned by the pharmacy. For branded drugs in the highest tercile (columns 9 and 10), we estimate that insurers experiencing an enrollment increase of 100,000 are able to negotiate away 4.7 to 7.2 percent of profits earned by the pharmacy on a drug prescription—an effect size similar to that which we estimated for generic drugs. These results are consistent with the notion that manufacturers appropriate nearly all available profits for molecules with few competitors, leaving little for pharmacies and insurers to bargain over, regardless of changes in their market power.

4.3 External Effects of Part D Enrollment on Commercial Market

When considering the performance of the private Part D insurers, attention must also be paid to potential insurer enrollment effects on individuals outside of Medicare. In theory, insuring entities negotiate pharmacy prices for their entire enrollment. Hence, any retail price decreases negotiated by Part D insurers apply to its entire enrollment, including its commercial business—a potentially large external benefit of administering Part D through large private commercial

[20] Therapeutic sub-class definitions are taken from the Multum drug class categorization used in the Medical Expenditure Panel Survey Prescribed Medicines file.

insurers. To verify this, we repeat estimation of equation (9) using pharmacy claims associated with prescriptions filled by the non-elderly commercially enrolled (i.e., outside both Medicare and Medicaid). We find that increased insurer enrollment induced by Part D leads to lower drug costs for the non-elderly commercially enrolled, with greater declines in cost going to enrollees of insurers that experience larger increases in Part D enrollment.

Results of this analysis are reported in Table 10. Panel A compares retail pharmacy prices in the second half of 2005 to the first half of 2006. Panel B compares prices in the second half of 2005 to prices in the second half of 2006. Similar to the results reported in Tables 3-5, we find that an enrollment increase of 100,000 enables insurers to negotiate nearly a two-percent decline in pharmacy drug prices in the commercial market. The effect is negligible for branded drugs, but economically large and statistically significant for generics. We suspect that the small discrepancy between the enrollment effects estimated in Table 9 and Tables 3-5 reflect differences in the type drugs utilized by seniors and non-seniors.

In any case, this result implies that on the margin, administering Medicare drug insurance under the umbrella of private insurers has both a direct benefit—e.g. effects on drug utilization, as found by Lichtenberg and Sun (2007), Yin *et al* (2008), Duggan and Scott-Morton (2008) and Ketcham and Simon (2008), and an *indirect external* benefit for insured outside of the Part D program.

4.4 Savings Pass-through

Table 10 reports results from estimating equation (16). Overall, we find evidence roughly consistent with extensive pass-through. For every dollar decline in the annual cost of drug utilization, premiums decline by $0.33 (column 1). Recall that the decline in annual negotiated drug cost is likely to be correlated with increases in negotiated rebates, implying that our estimated pass-through rate will be over-estimated. As expected, when we control for the overall size of the insurer in the commercial market (which, as a measure of changes in the overall size of the insurer, serves as a proxy for insurer bargaining power in the fixed-effects model specified in equation 16), the coefficient drops to $0.30. This implied that omitting rebates from the regression is likely biasing our coefficient on the *BasketCost* up.[21] The coefficient estimates are

[21] The regression also includes interactions between *BasketCost* and characteristics of the plans. For plans that include a deductible, or accepts a subsidy for enrolling low-income seniors (who on average have higher

statistically significant at the 90-percent level. Imprecision is at least in part due to our common basket being defined across all plans. Ideally, we would have a plan-specific basket that reflects the expenditure risk of each plan.

We also test whether the degree of pass-through depends on the degree of competition in the local Part D plan market. We include an interaction between *BasketCost* and the number of insurers competing in each plan's market, and find no differential pass-through effect (column 3). At least for the number of insurers currently competing in each Part D market, this suggests that competition is sufficiently strong so as to force insurers in each market to distribute costs and savings similarly.

5. Implications for Policy

5.1 Theoretical Implications

Our results suggest that insurer enrollment lowers the prices received by pharmacies for generic drugs and branded drugs with therapeutic or generic competitors. However, there is little impact on the pricing of branded drugs without close substitutes. Similarly, pharmacy profits per pill suffer with insurer enrollment, for drugs with therapeutic competition, but are largely unaffected for drugs without it.

In light of the theory, these findings yield a number of positive implications. The impact of enrollment on profits for competitive drugs suggests that pharmacies have market power vis-à-vis insurers, and that the profits they earn are sensitive to insurer size. The theory predicts that changes in insurer leverage should have qualitatively similar effects on the profits earned by manufacturers and pharmacies. Therefore, we can conclude that manufacturers of branded drugs with substitutes lose profits in the face of higher enrollment. It is uncertain what happens to profits for generic drug manufacturers, which may already be negligible.

The complementary findings for branded drugs with no competition, however, suggest that manufacturers earn all available rents on such drugs, leaving nothing for the insurer or the pharmacy. We presume that, since larger enrollment increases insurer negotiating leverage in

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expenditure), drug costs are at least in part shared by enrollees at the point of service, or shared by the government, and so are not passed-on to premium. Plans characteristics are defined so that the coefficient on the uninteracted *BasketCost* can be interpreted as the pass-through for plans that have no deductible and do not accept the low-income subsidy.

the case of branded drugs with competitors, it should have the same qualitative impact for branded drugs without competitors. Therefore, our finding can be explained only if pharmacies are earning no rents on such drugs. Moreover, the positive correlation between pharmacy and insurer rents then suggests that insurers are likewise extracting little from manufacturers, who retain the entire surplus.

From a policy perspective, our results suggest that encouraging consolidation within the insurance industry has few benefits for consumers of branded drugs without competitors, but significant benefits for patients using drugs with therapeutic substitutes. It is likely to reduce premiums, since negotiated drug costs representing half of all pharmaceutical expenditures are likely to fall with consolidation. From a dynamic perspective, insurer consolidation lowers the relative profits available on drugs with therapeutic substitutes. Therefore, it encourages more "novel" pharmaceutical innovations and forces substitution away from follow-on molecules with existing competitors. From the perspective of pharmacies, insurer consolidation lowers the rents to be earned within this sector, insofar as profits on competitive drugs fall. In the long-run, this will lead to the exit of marginal pharmacies (and perhaps reductions in access to retailers) and to reductions in consumer prices. On the downside, however, this could raise the non-pecuniary costs of patronizing pharmacies if closures raise travel times. Further, significant insurer consolidation could also lead to anti-competitive downstream insurance markets (Dafny 2008).

5.2 Implications of Insurer Consolidation for the Distribution of Rents

Our main findings imply that Part D enrollment increases are associated with declines in the drug prices insurers negotiate with pharmacies, specifically for drugs with therapeutic substitutes. A fixed proportion of these savings are, by statute, eventually passed on to Medicare. Suggestive results from the pass-through analysis imply that insurer costs savings are also reflected in consumer premiums, and so are passed on to enrollees. These results can be used to simulate hypothetical policies that consolidate the Part D insurance market. Simulating consolidation is motivated by proposals to reduce the number of insurers and plans in the market, and more generally by ongoing discussion over more efficient ways for Medicare to contract with private insurers to administer the Part D benefit.[22]

[22] Lucarelli, Prince and Simon (2008) discuss some of these proposals as motivation for estimating a structural model to quantify the welfare loss from premium increases and choice reductions associated with

The main objective of this analysis to derive rough estimates of total program costs, premiums and enrollment that accrue from changes to the organization of the Part D market. For the purposes of this simulation, we envision consolidation on the order of a one-third reduction in the number of Part D insurers. This is equivalent to reducing the average number of insurers per CMS-defined Part D market from 25 to 17. While anti-competitive premium pricing may result from significant consolidation (Dafny 2008), our hypothetical policy likely leaves a sufficiently large number of insurers, and the possibility of premium regulations, to ensure a significant degree of price competition.

Note that insurers vary in their overall costs. The range of pharmacy costs span approximately 10-percent of the mean basket cost. Thus, consolidation can occur on two margins. First, one could reduce the number of insurers, holding the distribution of insurer costs constant. This isolates the pure effect of improved insurer bargaining power. A second possibility is to reallocate Part D enrollees to low-cost insurers, holding the number of enrollees per insurer constant. This is often called "selective contracting." For our simulations, we first estimate the effect on program costs, premiums and enrollment given a reduction in the number of insurers by one-third, holding the distribution of costs constant.

To do this, we require three parameters: the enrollment elasticity of drug costs; the degree to which insurer cost savings are passed on to enrollees; and an elasticity of demand for drug insurance. These can be estimated from a system of three equations:

(17a) $Cost_{f,t} = f(Enrollment_{f,t}, X_{f,t})$.

(17b) $premium_{p,f,t} = g(Cost_{f,t}, W_{p,f,t})$

(17c) $Enrollment_{p,f,t} = h(premium_{p,f,t}, Cost_{f,t}, Z_{p,f,t})$

Equation (17a) is the insurer cost-enrollment equation whose estimation we reported in section 4.1 and 4.2. Equation (17b) is the premium-cost equation we estimate in section 4.4. Finally, equation (17c) is the market demand equation for Part D insurance. Rather than estimating an insurance demand equation, we draw estimates from existing literature. Gruber (2001) matches insurance coverage status to tax subsidies to health insurance to estimate a demand elasticity of -0.6. Elsewhere, demand elasticities, particularly for individual private insurance, are estimated to

reduction in the number of Part D plans. The effects of consolidation on bargaining power in price negotiations are not examined in the study.

be as high as -1.8 (Gruber and Poterba, 1994). We use conservative estimates from Gruber (2001) of -0.6 as our base estimate in our simulations.

A reduction in the number of insurers by one-third is roughly equivalent to an average increase of 70,000 enrollees to the remaining insurers. Estimates from Table 3 of the enrollment effect on prices (normalized to enrollment increases of 100,000) suggest that a hypothetical enrollment increase of this size leads to a 1.75-percent decline in negotiated pharmacy prices—a lower bound on the reduction in the total cost of drugs that does not account for savings from increased discounts negotiated from manufacturers. If we interpret the model in Section 2 literally and assume the enrollment elasticity of log profits estimated in Table 6 applies to both pharmacy and manufacturer profits, then an enrollment increase of this size leads to a 3.5-percent decline in total drug costs.

The pass-through results suggest that on the margin, cost savings are passed on to enrollees. Hence, for the standard benefit plans, roughly 75 percent of cost savings are automatically passed on to the government as lower subsidies, while 25 percent is passed on to enrollees as lower premiums. Based on current Part D program costs, currently $30/month in premiums (for the standard benefits plans) and $90 in federal subsidies for each enrollee, we calculate that the hypothetical consolidation would generate an estimated savings of 1.75 to 3.5 percent, equivalent to a $500 million to $1 billion savings to the federal government in 2009 alone. A reduction in premiums by 1.5 to 3 percent is expected to increase enrollment by 260,000 to 520,000 Medicare beneficiaries. Combining consolidation with some selective contracting would likely achieve even larger program savings and enrollment increases.

6. Conclusion

Our results suggest significant benefits from consolidation in the Part D insurance market, so long as savings negotiated by insurers are largely passed on as lower premiums. A small number of low-cost private insurers may attain the lowest costs to Part D; although consolidating the market past some threshold may lead to anti-competitive pricing in which insurers extract rents in the downstream insurer-enrollee market (Dafny 2008). A single public purchaser that negotiates like a private insurer, by comparison, would pass on savings to enrollees.

However, our results also illustrate the interaction between insurer market power, and the competitive pressure faced by manufacturers. For molecules with little competition, insurer

consolidation is unlikely to make significant price inroads, as manufacturers appear to hold all or nearly all the market power available. However, for drugs that have identical or therapeutically similar molecular equivalents, price-negotiation by insurers can have significant benefits for consumers. Naturally, the optimal degree of competitiveness faced by manufacturers depends both on efficient drug pricing, and the provision of sufficient incentives to innovate. Therefore, it is not clear whether policies to increase competition among manufacturers (e.g., shorter or narrower patents) would harm future welfare by more than they enhance current welfare. Within the current publicly funded but privately administered model, selective contracting and enrollment consolidation must be accompanied by a selection mechanism that encourages insurer entry into Part D, while ensuring that premiums reflect the lower costs achieved by insurers.

Finally, our results highlight a potentially important, but little discussed, benefit of the Part D contracting model: its external benefits for commercial insureds. If Part D confers competitive advantages on payers who write insurance outside the Part D environment, its social gains may extend beyond the Part D population. Indeed, given the concentration of the prescription drug insurance marketplace, these external effects have the potential to affect many outside the Part D program, and perhaps to rival the direct benefits of Part D to those participating in the program.

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Figure 1. Transfers and Payments in the Prescription Drug Market

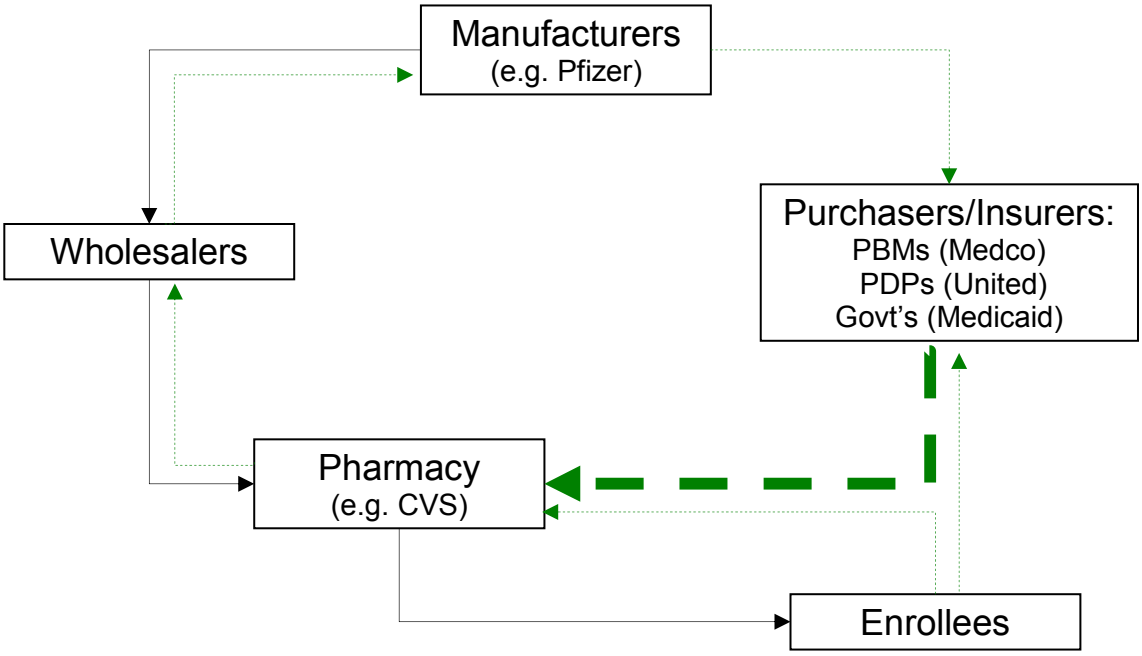
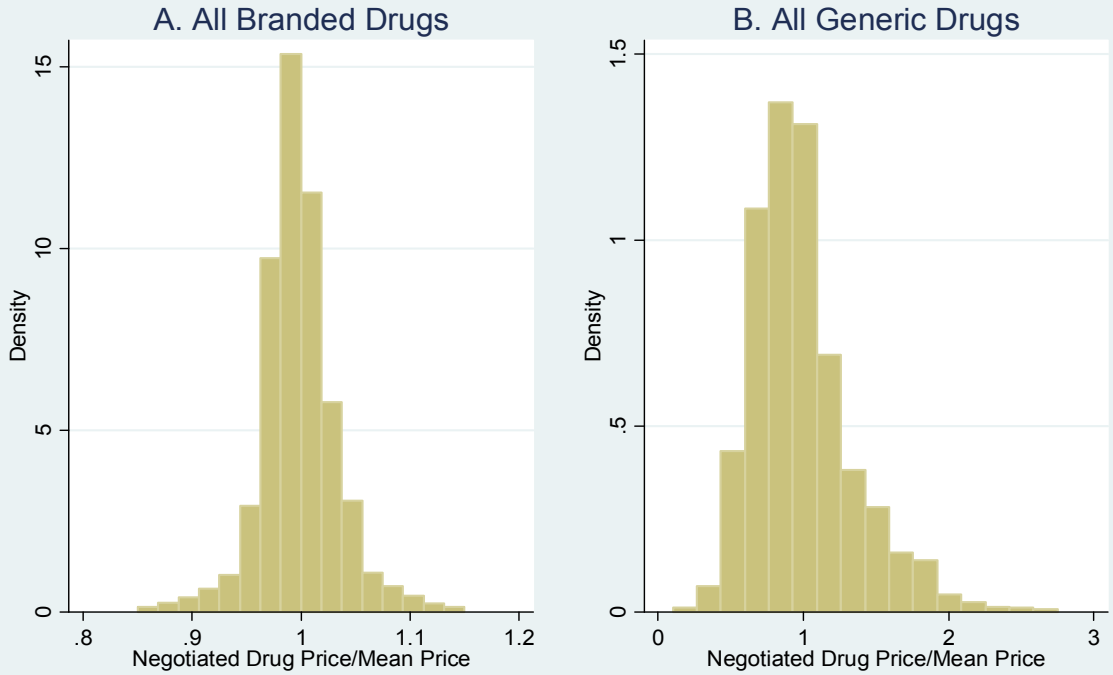


Figure2. Distribution of Drug Prices, Relative to Mean Price



September 2005

Figure 3. Distribution of Adjusted Premiums

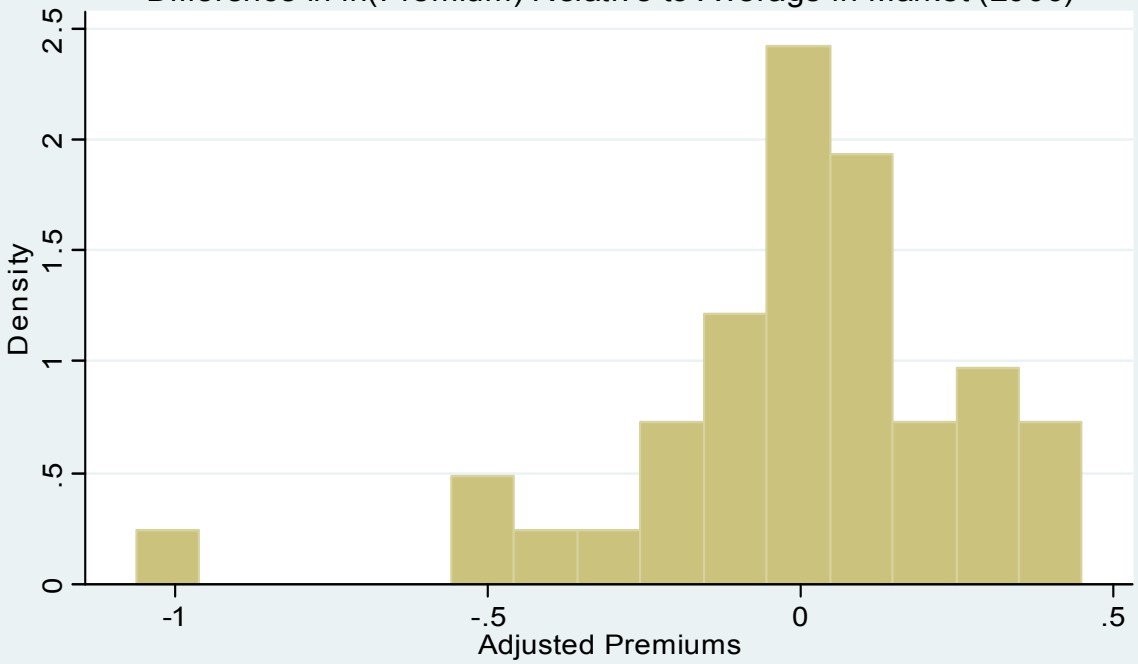


Table 1. Rank of Drugs by Sales among Seniors in Pharmacy Claims

Rank	Drug	MEPS Rank (Among Seniors)
1	LIPITOR	1
2	PLAVIX	4
3	ZOCOR	2
4	NORVASC	6
5	PREVACID	10
6	NEXIUM	5
7	FOSAMAX	8
8	ADVAIR	16
9	PROTONIX	15
10	PRAVACHOL	11
11	DIOVAN	14
12	ACTOS	17
13	CELEBREX	12
14	TOPROL XL	7
15	AVANDIA	18
16	COREG	21
17	AMBIEN	58
18	ARICEPT	20
19	ACTONEL	31
20	LEVAQUIN	98
21	ZETIA	19
22	ZOLOFT	22
23	FLOMAX	33
24	ACIPHEX	34
25	COSAAR	40

The table lists the top 25 drugs, ranked by expenditures between 2004 and 2005, in the claims of the collaborating pharmacy for seniors ages 65 and older. Expenditures are measured as the total reimbursement received by the pharmacy from the customer and third party payers. The corresponding rank for these drugs among seniors in the Medical Expenditure Panel Survey (MEPS) is shown on the right. MEPS rankings are claculated from the 2004 and 2005 Prescription Medicines modules. High ranking drugs in the MEPS that do not appear in the pharmacy claims include Procrit (rank #3 in the MEPS, rank #79 in the pharmacy claims) and Atenolol (#9 in MEPS, #62 in pharmacy claims), boith of which are often physician administered. Other drugs ranked in the top 25 by the MEPS include ; Metformin (#13 in MEPS, #29 in pharmacy claims); Ranitidine (#23 in MEPS, #122 in pharmacy); Evista (#24 in MEPS, #33 in pharmacy); and Lotrel (#25 in MEPS, #41 in pharmacy).

Table 2. Distribution of Insurers by 2007 Part D Enrollment

	Below Median	Above Median	50-75th Percentile	75-90th Percentile	90-95th Percentile	Above 95th Percentile
	(1)	(2)	(3)	(4)	(5)	(6)
Insurer's Part D Enrollment	< 6,400	> 6,400	6,400-28,000	28,000-126,000	126,000-354,000	> 354,000
No. of Insurers	124	124	62	36	13	13
No. of Insurers Appearing in Claims	15	71	29	21	9	12
Fraction of Insurers Appearing in Claims	0.22	0.87	0.46	0.54	0.70	0.95

The table shows the distribution of insurers by their Part D enrollment. For each of the enrollment bins, the table also reports the number insurers for which we observe pharmacy claims. The bottom row reports the fraction of insurers appearing in the claims, weighted by their Part D enrollment.

Table 3. Enrollment Effect on Pharmacy Drug Prices: Second Half 2005 vs First Half 2006

Dependent Variable: ΔIn(Drug Price per Pill)						
Model	OLS	OLS	OLS	IV	IV	IV
	(1)	(2)	(3)	(4)	(5)	(6)
ΔFirm's PartD Enrollment (1M)	-0.016***	-0.170***	-0.147**	-0.018***	-0.250***	-0.223***
	(0.003)	(0.060)	(0.054)	(0.004)	(0.084)	(0.071)
ΔFirm's PartD Enrollment^2 (1M)		0.032**			0.048***	
		(0.013)			(0.018)	
Δ Log Avg Quantity per Rx	-0.243***	-0.244***	-0.233***	-0.243***	-0.244***	-0.233***
	(0.028)	(0.028)	(0.027)	(0.028)	(0.028)	(0.027)
Δ Log Exposure to Pharmacy	-0.009	-0.139	-0.126	-0.002	-0.204	-0.191
	(0.229)	(0.177)	(0.174)	(0.220)	(0.155)	(0.153)
Δ Log AWP of Drug	-0.071***	-0.071***	-0.057***	-0.071***	-0.072***	-0.057***
	(0.017)	(0.018)	(0.016)	(0.017)	(0.018)	(0.016)
Constant	-0.022	0.016	0.012	-0.020	0.037*	0.034*
	(0.022)	(0.013)	(0.013)	(0.022)	(0.022)	(0.020)
Exluded Instruments					(a) (b)	
Potential Enrollment (1M)				0.055*	-0.058 -0.139	0.025***
				(0.031)	(0.068) (0.232)	(0.007)
Potential Enrollment^2 (1M)					0.005 0.008	
					(0.004) (0.012)	
Adjusted Premium				-3.386***	1.046*** 6.549***	-0.202
				(0.379)	(0.390) (1.529)	(0.170)
Adjusted Premium^2					-4.684*** -24.358***	
					(0.373) (1.436)	
F-stat for Excluded Variables				43.02	2623.57 4636.31	8.58
Insurer Sample	All	All	No Humana	All	All	No Humana
Number of Insurers	34	34	33	34	34 34	33
R-squared	0.12	0.13	0.12			
Drug-Insurer-State Observations	37186	37186	33122	37186	37186	33122

The table reports the estimated effect of changes in insurer enrollment on changes in the log of drug prices negotiated between the pharmacy and the insurer. Specifically, the dependent variable is the change in the log average price per pill for a given drug in a given state charged to a given insurer between the second half of 2005 and the first half of 2006. The key regressor is the change in the insurer's Part D enrollment between 2005 and 2006. The regressions control for the change in the log average number of pills per prescription in each drug-insurer-state cell, the change in the drug's average per-pill wholesale price, and the change in each *insurer's* exposure to the pharmacy (calculated as the pharmacy's weighted average share of the pharmacy market in areas where the insurer is present). The sample of drugs comprises the top 1000 drugs (ranked by expenditures) observed in the pharmacy claims. Instruments for actual Part D enrollment include the *potential Part D enrollment* and the *adjusted premium* variables. Columns 1 and 4 report OLS and IV estimates of a linear enrollment effect for the full sample of insurers. Columns 2 and 5 report OLS and IV estimates for the full sample of insurers including a squared change-in-enrollment variable. Columns 3 and 6 report OLS and IV estimates for specifications with a linear enrollment term, but where Humana is dropped from the sample. Parentheses report standard errors clustered at the insurer level. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4. Enrollment Effect on Pharmacy Drug Prices, by Drug Type: Second Half 2005 vs First Half 2006

Dependent Variable: ΔIn(Drug Price per Pill)				
Drug Sample	Branded		Generics	
Model	IV	IV	IV	IV
	(1)	(2)	(3)	(4)
ΔFirm's PartD Enrollment (1M)	-0.026**	-0.020*	-0.580***	-0.514***
	(0.013)	(0.012)	(0.172)	(0.152)
ΔFirm's PartD Enrollment^2 (1M)	0.005*		0.114***	
	(0.003)		(0.036)	
Δ Log Avg Quantity per Rx	-0.046***	-0.044***	-0.382***	-0.364***
	(0.007)	(0.007)	(0.036)	(0.034)
Δ Log Exposure to Pharmacy	-0.003	0.002	-0.400	-0.371
	(0.030)	(0.030)	(0.311)	(0.310)
Δ Log AWP of Drug	0.148***	0.149***	0.013	0.021**
	(0.010)	(0.010)	(0.011)	(0.009)
Constant	0.041***	0.040***	0.032	0.027
	(0.004)	(0.003)	(0.045)	(0.042)
Insurer Sample	All	No Humana	All	No Humana
Number of Insurers	34	33	34	33
Drug-Insurer-State Observations	19652	17557	17534	15565

The table reports the effect of changes in insurer enrollment on changes in the log of drug prices negotiated between the pharmacy and the insurer for IV specification, separately for all branded and all generic drugs, between the second half of 2005 and the first half of 2006. Specifically, the dependent variable is the change in the log average price per pill for a given drug in a given state charged to a given insurer between the second half of 2005 and the first half of 2006. The key regressor is the change in the insurer's Part D enrollment between 2005 and 2006. The regressions control for the change in the log average number of pills per prescription in each drug-insurer-state cell, the change in the drug's average per-pill wholesale price, and the change in each insurer's exposure to the pharmacy (calculated as the pharmacy's weighted average share of the pharmacy market in areas where the insurer is present). The sample of drugs comprises the top 1000 drugs (ranked by expenditures) observed in the pharmacy claims. Instruments for actual Part D enrollment include the *potential Part D enrollment* and the *adjusted premium* variables. Parentheses report standard errors clustered at the insurer level. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 5. Enrollment Effect in Pharmacy Drug Prices: Alternative Comparison Periods

Dependent Variable: ΔIn(Drug Price per Pill)

Panel A: Second Half 2005 vs Second Half 2006

Drug Sample	All		Branded		Generics	
Model	IV	IV	IV	IV	IV	IV
	(1)	(2)	(3)	(4)	(5)	(6)
ΔFirm's PartD Enrollment (1M)	-0.215**	-0.210***	-0.019	-0.017	-0.599***	-0.574***
	(0.085)	(0.067)	(0.019)	(0.019)	(0.178)	(0.152)
ΔFirm's PartD Enrollment^2 (1M)	0.041**		0.002		0.116***	
	(0.018)		(0.004)		(0.037)	
Insurer Sample	All	No Humana	All	No Humana	All	No Humana
Number of Insurers	34	33	34	33	34	33
Drug-Insurer-State Observations	32438	28584	17256	15247	15182	13337

Panel B: Second Half 2004 vs Second Half 2005

Drug Sample	All		Branded		Generics	
Model	IV	IV	IV	IV	IV	IV
	(1)	(2)	(3)	(4)	(5)	(6)
ΔFirm's PartD Enrollment (1M)	-0.003	-0.002	0.006	0.009	-0.052	-0.054
	(0.031)	(0.027)	(0.008)	(0.007)	(0.072)	(0.059)
ΔFirm's PartD Enrollment^2 (1M)	0.000		-0.001		0.010	
	(0.007)		(0.002)		(0.015)	
Insurer Sample	All	No Humana	All	No Humana	All	No Humana
Number of Insurers	34	33	34	33	34	33
Drug-Insurer-State Observations	32099	29670	17130	15856	14969	13814

The table reports the estimated enroillment effect of changes in insurer enrollment on changes in negotiated pharmacy drug prices for IV specifications, separately for all drugs, all branded, and all generic drugs. Panel A compares changes between the second half of 2005 to the second half of 2006. As a falsification test, Panel B compares changes between the second half of 2004 and the second half of 2005. The dependent variable is the change in the log average price per pill for a given drug in a given state charged to a given insurer between the specified pre- and post-periods. The key regressor is the change in the insurer's Part D enrollment between the pre- and post-period years. For space considerations, the table does not report coefficient estimates on control variables, which include the change in the log of the average number of pils per prescription in each drug-insurer-market cell, the change in the average per-pill wholesale price of the drug, and the change in each insurer's exposure to the pharmacy. The sample of drugs comprises the top 1000 drugs (ranked by expenditures) observed in the claims. Instruments for actual Part D enrollment include the *potential Part D enrollment* and *adjusted premium* variables. Parentheses report standard errors clustered at the insurer level. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 6. Enrollment Effect on Pharmacy Profits-per-Pill: Second Half 2005 vs First Half 2006

Dependent Variable: ∆ln(Drug Profit per Pill)				
Drug Sample: All Drugs				
Model	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
∆Firm's PartD Enrollment (1M)	-0.290**	-0.512**	-0.250**	-0.414**
	(0.131)	(0.201)	(0.113)	(0.190)
∆Firm's PartD Enrollment^2 (1M)	0.056*	0.102**		
	(0.028)	(0.042)		
∆ Log Exposure to Pharmacy	0.434***	0.433***	0.452***	0.451***
	(0.033)	(0.032)	(0.030)	(0.029)
∆ Log AWP of Drug	-0.028*	-0.029**	-0.032*	-0.032**
	(0.014)	(0.013)	(0.016)	(0.015)
Constant	0.164***	0.221***	0.159***	0.206***
	(0.026)	(0.049)	(0.026)	(0.047)
Insurer Sample	All	All	No Humana	No Humana
Number of Insurers	34	34	33	33
R-squared	0.05		0.05	
Drug-Insurer-State Observations	36581	36581	32656	32656

The table reports the estimated effect of changes in insurer enrollment on changes in the log of pharmacy profiits per pill. The dependent variable is the change in the log average profit per pill earned by the pharmacy on a given drug in a given state on transactions with a given insurer between the second half of 2005 and the first half of 2006. The key regressor is the change in the insurer's Part D enrollment between 2005 and 2006. The regressions control for the change in the average per-pill wholesale price of the drug, and the change in each insurer's exposure to the pharmacy, which is calculated as the pharmacy's weighted average share of the retail pharmacy market in areas where the insurer is present. The sample of drugs comprises the top 1000 drugs (ranked by expenditures) observed in the claims. Columns 1-2 report OLS and IV estimates for linear and squared change-in-enrollment specifications for the complete sample of insurers. Columns 3-4 report OLS and IV estimates for linear enrollment specifications where Humana is dropped from the sample. Instruments for actual Part D enrollment include the potential Part D enrollment and the adjusted premium variables. Parentheses report standard errors clustered at the insurer level. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 7. Enrollment Effect on Pharmacy Profits-per-Pill, by Drug Type: Second Half 2005 vs First Half 2006

Dependent Variable: ΔIn(Drug Profit per Pill)				
Drug Sample	Branded		Generics	
Model	IV	IV	IV	IV
	(1)	(2)	(3)	(4)
ΔFirm's PartD Enrollment (1M)	-0.286	-0.138	-0.936***	-0.847***
	(0.190)	(0.188)	(0.292)	(0.265)
ΔFirm's PartD Enrollment^2 (1M)	0.056		0.188***	
	(0.039)		(0.061)	
Δ Log Exposure to Pharmacy	-0.127*	-0.092*	0.816***	0.828***
	(0.066)	(0.053)	(0.053)	(0.059)
Δ Log AWP of Drug	0.360***	0.339***	0.031	0.030
	(0.038)	(0.044)	(0.030)	(0.035)
Constant	0.222***	0.187***	0.229***	0.228***
	(0.052)	(0.048)	(0.078)	(0.078)
Insurer Sample	All	No Humana	All	No Humana
Number of Insurers	34	33	34	33
Drug-Insurer-State Observations	19244	17268	17337	15388

The table reports the estimated effect of changes in insurer enrollment on changes in the log of pharmacy profiits per pill, separately for all branded and all generic drugs. The dependent variable is the change in the log average profit per pill earned by the pharmacy on a given drug in a given state on transactions with a given insurer between the second half of 2005 and the first half of 2006. The key regressor is the change in the insurer's Part D enrollment between 2005 and 2006. The regressions control for change in the average per-pill wholesale price of the drug, and the change in each insurer's exposure to the pharmacy, which is calculated as the pharmacy's weighted average share of the retail pharmacy market in areas where the insurer is present. The sample of drugs comprises the top 1000 drugs (ranked by expenditures) observed in the claims. Instruments for actual Part D enrollment include the *potential Part D enrollment* and the *adjusted premium* variables. Columns 1-2 report IV estimates for linear and linear-squared change-in-enrollment specifications for the sample of branded drugs. Columns 3-4 report IV estimates for linear and linear-squared change-in-enrollment specifications for the sample of generic drugs. the complete sample of insurers. Parentheses report standard errors clustered at the insurer level. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 8. Enrollment Effect on Pharmacy Profits-per-Pill for Branded Drugs, by Competitveness: Second Half 2005 vs First Half 2006

Dependent Variable: ΔIn(Drug Profit per Pill)										
Definition of Substitute	Generic Drugs Within Compound				Generic Drugs Within Therapeutic Sub-Class					
Number of Substitutes	None	None	One or More	One or More	Lower Tercile	Lower Tercile	Middle Tercile	Middle Tercile	Highest Tercile	Highest Tercile
Model	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ΔFirm's PartD Enrollment (1M)	-0.223	-0.095	-0.608***	-0.383*	-0.071	0.040	-0.381*	-0.233	-0.723***	-0.469*
	(0.198)	(0.198)	(0.234)	(0.212)	(0.172)	(0.180)	(0.215)	(0.204)	(0.280)	(0.275)
ΔFirm's PartD Enrollment^2	0.044		0.123***		0.012		0.076*		0.146**	
	(0.041)		(0.048)		(0.035)		(0.044)		(0.057)	
Δ Log Exposure to Pharmacy	-0.383	-0.289	-0.675	-0.501	-0.046	0.053	-0.770	-0.665	0.188	0.305
	(0.534)	(0.507)	(0.682)	(0.613)	(0.451)	(0.442)	(0.608)	(0.584)	(0.893)	(0.771)
Δ Log AWP of Drug	-0.013	-0.025	1.083***	1.069***	1.279***	1.224***	-0.810***	-0.784***	0.008	0.049
	(0.061)	(0.067)	(0.072)	(0.078)	(0.059)	(0.053)	(0.116)	(0.119)	(0.086)	(0.079)
Constant	0.185***	0.153***	0.388***	0.338***	0.106**	0.078	0.328***	0.293***	0.349***	0.286***
	(0.054)	(0.051)	(0.077)	(0.074)	(0.048)	(0.049)	(0.060)	(0.053)	(0.101)	(0.099)
Insurer Sample	All	No Humana	All	No Humana	All	No Humana	All	No Humana	All	No Humana
Number of Insurers	34	33	34	33	34	33	34	33	34	33
Drug-Insurer-State Observations	15186	13621	4058	3647	8505	7631	8028	7195	2711	2442

The table reports the estimated enrollment effect of changes in insurer enrollment on changes in pharmacy profits per pill for branded drugs, stratified by the drug's degree of therapeutic substitutability. Two conventional definitions of substitutability are used: 1) columns 1-4 stratify the sample of drugs by the number of generic substitutes each drug faces (which captures on-patent versus off-patent drug status); and 2) columns 5-10 stratifies by the number of generic drugs on the market within therapeutic drug subclass. We use Multum therapeutic subclass definitions for the purpose of this analysis. The dependent variable is the change in the log average profit per pill earned by the pharmacy on a given drug in a given state on transactions with a given insurer between the second half of 2005 and the first half of 2006. The key regressor is the change in the insurer's Part D enrollment between 2005 and 2006. The regressions control for change in the average per-pill wholesale price of the drug, and the change in each insurer's exposure to the pharmacy, which is calculated as the pharmacy's weighted average share of the retail pharmacy market in areas where the insurer is present. The sample of drugs comprises the top 1000 drugs (ranked by expenditures) observed in the claims. Instruments for actual Part D enrollment include the *potential Part D enrollment* and the *adjusted premium* variables. For space considerations, we report results from the IV specifications. Parentheses report standard errors clustered at the insurer level. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 9. Enrollment Effect in Pharmacy Drug Prices: Commercial Non-Part D Business

Dependent Variable: ΔIn(Drug Price per Pill)

Panel A: Second Half 2005 vs First Half 2006

Drug Sample	All		Branded		Generics	
Model	IV	IV	IV	IV	IV	IV
	(1)	(2)	(3)	(4)	(5)	(6)
ΔFirm's PartD Enrollment (1M)	-0.168**	-0.151**	-0.035***	-0.030**	-0.376**	-0.345**
	(0.083)	(0.072)	(0.011)	(0.012)	(0.161)	(0.140)
ΔFirm's PartD Enrollment^2 (1M)	0.034*		0.007***		0.076**	
	(0.018)		(0.002)		(0.034)	
Insurer Sample	All	No Humana	All	No Humana	All	No Humana
Number of Insurers	34	33	34	33	34	33
Drug-Insurer-State Observations	20165	18171	10615	9586	9550	8585

Panel B: Second Half 2005 vs Second Half 2006

Drug Sample	All		Branded		Generics	
Model	IV	IV	IV	IV	IV	IV
	(1)	(2)	(3)	(4)	(5)	(6)
ΔFirm's PartD Enrollment (1M)	-0.180*	-0.171**	-0.026	-0.021	-0.458**	-0.417**
	(0.094)	(0.077)	(0.016)	(0.015)	(0.204)	(0.170)
ΔFirm's PartD Enrollment^2 (1M)	0.035*		0.005		0.091**	
	(0.020)		(0.003)		(0.042)	
Insurer Sample	All	No Humana	All	No Humana	All	No Humana
Number of Insurers	34	33	34	33	34	33
Drug-Insurer-State Observations	17156	15318	9061	8118	8095	7200

The table reports the estimated enroillment effect of changes in insurer enrollment on changes in negotiated pharmacy drug prices for claims associated with non-Part D, under 65, non-Medicaid pharmacy customers. Table reports IV specifications, separately for all drugs, all branded, and all generic drugs. Panel A compares changes between the second half of 2005 to the first half of 2006. Panel B compares changes between the second half of 2005 to the second half of 2006. The dependent variable is the change in the log average price per pill of a given drug in a given state charged to a given insurer between the specified time periods. The key regressor is the change in the insurer's Part D enrollment between the specified time periods. For space considerations, the table does not report coefficient estimates on control variables (change in the log of the average number of pils per prescription in each drug-insurer-market cell, the change in the average per-pill wholesale price of the drug, and the change in each insurer's exposure to the pharmacy). The sample of drugs comprises the top 1000 drugs (ranked by expenditures) observed in the claims. Instruments for actual Part D enrollment include the *potential Part D enrollment* and the *adjusted premium* variables. Parentheses report standard errors clustered at the insurer level. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 10. Premiums and Insurers' Cost of Drugs

Dependent Variable: Annual Stand-Alone Part D Plan Premiums			
	(1)	(2)	(3)
Cost of Basket	0.328*	0.304*	0.365
	(0.169)	(0.165)	(0.240)
No. Insurers in Region	-2.356	-3.150	13.467
	(3.233)	(3.305)	(51.349)
Annual Deductible ($100)	-239.525***	-166.605***	-161.483**
	(57.331)	(62.451)	(66.421)
Accepts Low Income Subsidy (Y/N)	83.739	97.112	89.211
	(150.662)	(151.345)	(153.047)
Cost of Basket x Annual Deductible ($100)	0.076***	0.053***	0.051**
	(0.018)	(0.020)	(0.021)
Cost of Basket x Accepts LIS	-0.053	-0.058	-0.056
	(0.049)	(0.049)	(0.049)
Number of Commercial Plans		2.497**	2.460**
		(1.111)	(1.135)
Cost of Basket x No. Insurers in Region			-0.004
			(0.016)
Year 2007	105.952**	87.313**	83.584*
	(41.614)	(40.734)	(43.633)
Constant	-832.274	-771.812	-1,000.301
	(652.306)	(636.815)	(912.208)
Plan Fixed Effects	Y	Y	Y
Plan Sample	Basic	Basic	Basic
Coverage in Gap	None	None	None
Number of Plans	835	835	835
R-squared	0.37	0.38	0.38
Observations	1315	1315	1315

The depend variable is the annual premium for Part D plans. The key regressor is the cost of a common basket of drugs, which varies across insurers due to differences in the cost of drugs negotiated by insurers. The regression controls for plan characteristics such as deductible size and whether the plan accepts low-income beneficiaries. The sample is limited to standard Part D benefit plans, and plans that are actuarially equivalent to the standard plan, offered in 2006 or 2007. Addtitional control variables include the number of competing Part D insurers in each market, and an interaction between the number of comptitors and the cost of the basket. All specifications include plan-level fixed effects. Parentheses report standard errors clustered at the insurer level. * significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Table 1. Trends in Pharmacy Drug Prices by Insurer Size (Second Half 2004 vs Second Half 2005)

Dependent Variable: ∆ln(Drug Price per Pill)		
Model	IV	IV
	(1)	(2)
Medium Insurer	-0.016	-0.016
	(0.012)	(0.012)
Large Insurer	-0.001	-0.000
	(0.011)	(0.011)
∆ Log Avg Quantity per Rx	-0.244***	-0.238***
	(0.031)	(0.030)
∆ Log Exposure to Pharmacy	-0.013	-0.012
	(0.016)	(0.016)
∆ Log AWP of Drug	0.078	0.071
	(0.015)	(0.016)
Constant	0.003	0.003
	(0.010)	(0.010)
Insurer Sample	All	No Humana
Number of Insurers	34	33
Drug-Insurer-State Observations	32099	29670

This table reports tests for whether trends in negotiated pharmacy drug prices prior to the implementation of Part D differed according to the size of insurers. Insurer size is proxied by the total expenditures in 2005 on all observed prescriptions associated with enrollees of an insurer. The insurers in the sample are categroized into terciles based on insurer size. The indicator for the smallest insurer size is the omitted insurer category. The dependent variable is the change in the log average negotiated price per pill paid to the pharmacy on a given drug in a given state by a given insurer between the second half of 2004 and the second half of 2005. The constant captures the change in negotiated drug prices for the omitted group, controlling for covariates. Coefficents on the indicators for *Medium* and *Large* insurers capture differences in trends in pharmacy drug prices relative to the omitted insurer category. Controls include the change in the average per-pill wholesale price of the drug, and the change in each insurer's exposure to the pharmacy, which is calculated as the pharmacy's weighted average share of the retail pharmacy market in areas where the insurer is present, and the change in the average wholesale price of a drug. The sample of drugs comprises the top 1000 drugs (ranked by expenditures) observed in the claims. Parentheses report standard errors clustered at the insurer level. * significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Table 2. Pharmacy Prices and Enrollment (by Drug Type): Second Half 2005 vs First Half 2006

Dependent Variable: ΔIn(Drug Price per Pill)									
Drug Sample	All			Branded			Generics		
Model	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ΔFirm's PartD Enrollment (1M)	-0.016***	-0.124**	-0.110**	-0.002***	-0.020**	-0.017**	-0.033***	-0.248**	-0.217**
	(0.003)	(0.052)	(0.046)	(0.000)	(0.009)	(0.008)	(0.006)	(0.107)	(0.095)
ΔFirm's PartD Enrollment^2 (1M)		0.023**			0.004*			0.045*	
		(0.011)			(0.002)			(0.023)	
Δ Log Avg Quantity per Rx	-0.251***	-0.252***	-0.243***	-0.049***	-0.050***	-0.048***	-0.385***	-0.386***	-0.372***
	(0.027)	(0.026)	(0.026)	(0.008)	(0.008)	(0.008)	(0.032)	(0.032)	(0.030)
Δ Log Exposure to Pharmacy	0.046	0.009	0.013	0.008	0.002	0.003	0.126	0.045	0.053
	(0.133)	(0.155)	(0.153)	(0.035)	(0.037)	(0.036)	(0.207)	(0.239)	(0.234)
Δ Log AWP of Drug	-0.072***	-0.073***	-0.061***	0.141***	0.141***	0.142***	0.013	0.011	0.018**
	(0.015)	(0.015)	(0.013)	(0.010)	(0.010)	(0.011)	(0.011)	(0.010)	(0.008)
Constant	-0.018	0.008	0.006	0.036***	0.040***	0.040***	-0.098***	-0.047***	-0.052***
	(0.017)	(0.009)	(0.009)	(0.003)	(0.002)	(0.002)	(0.034)	(0.017)	(0.018)
Insurer Sample	All	All	No Humana	All	All	No Humana	All	All	No Humana
Number of Insurers	74	74	73	74	74	73	74	74	73
R-squared	0.13	0.13	0.13	0.07	0.07	0.07	0.21	0.22	0.21
Drug-Insurer-State Observations	42628	42628	38564	22221	22221	20126	20407	20407	18438

The table reports the estimated enrollment effect of changes in insurer enrollment on changes in negotiated pharmacy drug prices for OLS specifications, between the second half of 2005 and the first half of 2006. The dependent variable is the change in the log average price per pill of a given drug in a given state charged to a given insurer between the second half of 2005 and the first half of 2006. The key regressor is the change in the insurer's Part D enrollment between 2005 and 2006. The insurer sample includes all insurers that entered the Part D market and is observed in the pharmacy claims. These specification include insurers for which the adjusted Part D premium instrument could not be calculated. Such insurers include those that entered *only* through demostration plans, employer-based retirement coverage, or Medicare Advantage plans. Accurate drug insurance premiums for these insurers could not be ascertained from CMS Part D plan data. The regressions control for the change in the log of the average number of pils per prescription in each drug-insurer-market cell, the change in the average per-pill wholesale price of the drug, and the change in each insurer's exposure to the pharmacy. The sample of drugs comprises the top 1000 drugs (ranked by expenditures) observed in the claims. Columns 1, 4 and 7 report estimates for specifications where enrollment appears linearly for the complete sample of insurers. Columns 2, 5 and 8 report estimates for specifications where the squared-enrollment is also included. Columns 3, 6 and 9 report estimates for specifications where enrollment enters linearly, and where Humana is dropped from the sample. Parentheses report standard errors clustered at the insurer level. * significant at 10%; ** significant at 5%; *** significant at 1%