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ABSTRACT

Household demand for actuarially unfair insurance against small risks has long puzzled economists. One way to potentially rationalize this demand is to recognize that (non-life) insurance is an incentive-compatible means of engaging an expert buyer. To quantify the benefits of expert buying, we compare prices paid by the insured and uninsured for health care. In categories of health care where uncompensated care is more difficult to obtain (drugs, doctor office visits, and hospital outpatient visits), we find that insurers pay 10-20% less than the uninsured. For forms of care where payment by the uninsured is more likely to be negotiated after services are rendered (hospitalizations and emergency room visits) the uninsured pay about 30% less on average, due largely to the nontrivial share of uninsured who pay 5% or less of their billed charges. At least in settings where free services are difficult to obtain, expert buying is an important benefit of insurance. We discuss the implications of the delegated-purchasing view of insurance for con-sumer-driven health insurance and for self-insurance by employers.

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1. Introduction

Economists have long been puzzled by two facts about consumer demand for insurance. On the one hand, consumers often neglect to purchase heavily subsidized insurance against large risks, such as the flood insurance offered by the U.S. government. On the other hand, consumers often purchase actuarially unfair insurance against small risks, such as extended warranties and service contracts (e.g., Cicchetti and Dubin (1994)). Because purchasing actuarially unfair insurance against small risks can only be rationalized in an expected utility framework by assuming an implausibly high level of risk aversion, this behavior is often cited as evidence of loss aversion or endowment effects (e.g., Rabin and Thaler (2001)).

In this paper, we offer a complementary explanation for the purchase of actuarially unfair insurance. Because experts can typically obtain goods and services at lower prices than other consumers, individuals might want to engage an expert to purchase items on their behalf. We do see some examples of expert buyers (securities brokers, travel agents, concierges), but their popularity is limited by agency problems. Namely, the expertise that makes these agents good buyers also enables them to take advantage of their principals.

In some settings, an insurance contract can solve this problem. Suppose that consumers all face the same probability of developing a problem (an appliance malfunction, a car crash, a health problem) that will have an uncertain cost to fix. Suppose also that the true cost of fixing the problem is unobservable to consumers, but is readily observable to any expert, after the consumer incurs a small, non-reimbursable inconvenience cost associated with having the problem evaluated. A consumer can buy insurance from an expert, who contracts to fix any problems that arise in exchange for a payment that is agreed upon ex ante, or the consumer can self-insure and pay an expert to fix any problems that arise.

In this setting, even risk-neutral consumers may buy insurance. They will not be buying for insurance motives per se; rather they will be buying because the insurance contract is an efficient means of engaging the purchasing expertise of the insurer. If the consumer attempts to buy an expert's services after the problem develops, the expert will use the fact that there is a search cost associated with having the problem evaluated to extract the ex post monopoly price from the consumer (Diamond (1971); see also Stahl (1989) and Ellison and Wolitzky (2011)). Now consider insurance sold by a competitive industry of providers who purchase repair services at competitive prices. Even if that insurance is actuarially unfair (due, for example, to administrative costs), if the difference between the competitive and ex post monopoly prices is large enough, even risk-neutral consumers will benefit from purchasing the insurance.[1]

Whether the benefits of expert buying are large relative to the well-understood inefficiencies associated with insurance (administrative costs, adverse selection, moral hazard) is an empirical question. Clearly, there are no such benefits for life insurance, where claims are settled with pre-defined monetary payments. But almost all other forms of insurance, such as property, liability, and health insurance, involve the insurer purchasing services on a claimant's behalf. Anecdotal evidence suggests that the benefits of purchasing expertise can be large. One author was once quoted $450 by an auto glass company to replace a cracked windshield and then, on the advice of a colleague, filed a claim with his insurer, despite having a $500 deductible. Doing so gave him access to the insurer's negotiated price, allowing him to obtain the same windshield, from the same company, for $175. Likewise, many readers will have received "explanation of benefits" statements, in which we observe our health insurers paying significantly less than the

[1] Mayers and Smith (1982) develop a positive theory of demand for insurance by (risk-neutral) corporations. Their list of seven potential benefits includes "real-service efficiencies", arising from the fact that "Insurance firms develop a comparative advantage in processing claims because of economies of scale and gains from specialization" (p. 285). Our argument is related, in that the purchasing of expertise required to negotiate competitive prices can be viewed as an additional source of "real-service efficiency."

initial charges demanded by medical providers. Another author was billed $2,161 for emergency room care, which was settled by the insurance company for only $619. Medical billing can be even more aggressive. A study of extreme charges by out-of-network providers found many examples in which out-of-network buyers were charged more than four times the Medicare payment for the identical procedure (AHIP (2009)). The most extreme case was $29,998 for an upper GI endoscopic visual diagnostic exam with biopsy for which the Medicare fee was $388.64. These anecdotes clearly suggest a role for buying expertise, but whether expertise translates into systematic differences in ultimate prices paid by privately insured and uninsured individuals is an empirical question.

For more systematic empirical evidence on the delegated purchasing benefits of insurance, we use data from the Medical Expenditure Panel Survey (MEPS) to measure differences in the prices that insured and uninsured individuals pay for a given drug or medical visit. Focusing on health insurance complicates our analysis for three reasons. First, as we discuss below, health care providers have legal and ethical duties to provide service to the uninsured; these duties do not exist to any meaningful extent in the other insurance settings that motivate our analysis (e.g., auto, product warranties). Second, health care providers are much more likely to have market power (e.g., a patented drug, or the one specialist in a geographic area) than providers of other insurance-purchased services. Market power for providers may both blunt the negotiating power of expert buyers and introduce price discrimination considerations that can work against the insured. Third, health insurance insures against a relatively large risk (e.g., McClellan and Skinner (2006), Finkelstein and McKnight (2008), and Finkelstein et al. (2011)), and thus demand for health insurance is not puzzling in the way that demand for actuarially unfair product warranties is. Our decision to focus on health insurance is driven by the facts that data is available on prices

actually paid by the insured and uninsured for comparable services and that we were unable to obtain comparable data from other settings. Despite these complications, we find that purchasing expertise is important in our setting. Insured consumers benefit from access to negotiated prices that are 10% to 20% lower than those paid by uninsured consumers.

Our analysis is cleanest for forms of care that are difficult to obtain for free and that have limited unobserved elements of quality. We begin, therefore, by analyzing prescription drugs, where we compare the prices that insured and uninsured consumers pay for the same packaging of the same pharmaceutical drug in the same calendar year. By comparing identical products, we rule out the possibility that uninsured consumers receive less expensive bundles of service than insured consumers. In pooled regressions, we find that drug prices are approximately 10 percent lower for those with insurance, and that the discount varies little with household income. Since this difference excludes possible rebates from pharmaceutical companies to insurance companies, it understates the benefit of negotiated prices. Furthermore, this difference exists despite the fact that drug companies know that insured clients will be less price sensitive, and thus should seek to price discriminate against them. Interestingly, the insurance discount disappears when we restrict our sample to the 7.3% of drugs that are sold through health clinics, which provide a channel for drug companies to target the most price-sensitive uninsured. The 10% average discount achieved by insurance company negotiators is arguably even more impressive in light of the adverse effects of insurance on price sensitivity.

Our second empirical strategy is to compare the fraction of billed charges that insured and uninsured individuals pay for the same type of medical service. Among the 98% of individuals who make more than a token payment on their own behalf or receive a payment from a private insurance company, we find that insured individuals pay 15.3 percentage points less of

their billed charges than uninsured individuals. This provides additional evidence that those buying insurance benefit from delegated purchasing. For office visits and outpatient visits, the insurance discount is about 20 percentage points, again excluding token payments and non-payments. However, in our full sample of hospitalizations and emergency room visits, where services are typically rendered before payments are collected, we find that insured individuals pay about 30 percentage points *more* than uninsured individuals on average. This difference is due entirely to the almost 20% of uninsured individuals who pay 5% or less of their billed charges. The bargaining power uninsured households receive from perceived obligations to treat may dominate the benefit of delegated purchasing, at least for those with low incomes.[2] Interestingly, we find that the delegated purchasing benefit of insurance has been rising in recent years, with the price advantage associated with insurance coverage increasing significantly since 2006 for prescription drugs, office visits, and outpatient visits.

The remainder of our paper is organized as follows. In Section 2, we discuss the related literature. In Section 3, we derive the conditions under which risk-neutral individuals benefit enough from delegated purchasing to purchase insurance that is worse-than-actuarially fair. In Section 4, we describe the data and empirical strategy that we use to test for differences in the prices paid for pharmaceutical drugs, and present our findings. In Section 5, we present our complementary analysis of the prices paid for other medical services. In Section 6, we summarize our findings and discuss the implications of the delegated-purchasing view of insurance for consumer-driven health insurance and for self-insurance by employers.

2. Related Literature

Our work contributes to a broad literature on the demand for insurance. Prior work has

[2] Our comparison excludes any payments collected from uninsured individuals by hospitals or collection agencies after the survey, so we may be overstating the bargaining power arising from obligations to treat.

focused primarily on consumers' insurance choices as a trade-off between the costs of administration, moral hazard and adverse selection and the benefits of risk reduction. Cutler and Zeckhauser (2000) review these issues for health insurance. In this context, risk reduction benefits—combined with government subsidies— are sufficient for many consumers to choose to purchase health insurance. In other contexts, such risk reduction benefits are minimal, and yet consumers continue to purchase insurance. For example, Cabral (2011) finds that ex post adverse selection limits the ability of dental insurance to provide much traditional insurance. The benefits from delegated purchasing that we discuss may help to rationalize the continued demand for dental insurance.

Our empirical work is most closely related to studies of negotiated prices in health care. Duggan and Scott Morton (2006) argue that Medicaid's drug pricing rule, which is to pay the average privately negotiated price, has the perverse effect of creating price-inelastic demand from Medicaid enrollees. This limits the bargaining power of insurance company negotiators, as excluding a drug from their formulary in response to high prices will not affect Medicaid demand. Consistent with this argument, they find higher prices for drugs with higher Medicaid market shares.

Medicare Part D, a government-sponsored drug insurance program for the elderly introduced in 2006, took a different approach to purchasing. Part D enrollees choose among privately sponsored (but heavily subsidized) insurance plans, with different premia and formularies. For many classes of drugs, the private plans have the flexibility to exclude specific drugs from their formularies in favor of substitutes. Evidence on whether this approach led to less drug price inflation is mixed. Duggan and Scott Morton (2010) find lower drug price increases between 2003 and 2006 for drugs with a higher share of previously uninsured elderly users, but the same

authors (2011) find this reversed by faster increases after 2006. Lakdawalla and Yin (2010) show that insurers with larger Part D enrollment negotiated lower prices for prescription drugs after the introduction of Medicare Part D, and that these lower prices spilled over to the non-elderly with coverage from the same insurance companies.

While we share with this work an interest in insurer-provider negotiation outcomes, our focus is different, which drives differences in our analysis. We are interested in explaining the popularity of different forms of (unsubsidized) insurance. The popularity of insurance is typically thought of as being driven by the tradeoff between moral hazard, adverse selection, and administrative costs on the one hand and risk sharing benefits on the other hand. Are the benefits of incentive-compatible expert buying important enough to be added to that equation?

To answer this question, we need to examine the individual-level outcomes of the insured and uninsured. Therefore, our analysis of drug prices is all within-drug. In contrast, because the work described above is motivated by concerns about the market-level effects of government insurance programs (which are important for fiscal and R&D incentive outcomes), Duggan and Scott Morton's (2010) analysis is between-drug and Lakdawalla and Yin's (2010) analysis is between-insurance companies. It should be clear that these types of analyses are not substitutes—it is plausible that private insurers might buy at lower prices than uninsured individuals, but that the extension of government-subsidized but privately-administered insurance might lead to higher prices.

In empirical work that is also related to ours, Gruber and Rodriguez (2007) compare the prices paid for office visits by uninsured individuals to the prices paid by insured individuals. The key insight of their paper is that, when measuring aggregate uncompensated care, it is appropriate to compare payments by uninsured individuals to payments made by (or on behalf of)

comparable insured patients, not to the billed charges. Since their paper focuses on the distribution of the burden of providing uncompensated care across physicians, they use proprietary data from a particular medical billing vendor that provides data on office visits to their doctor clients, and their main analysis is at the physician level. Our interest is in the insurance choices of individuals, so we can use the nationally representative MEPS data, which contain information on patient characteristics such as income and cover a broader range of medical services (drugs, ER visits, hospitalizations, and outpatient procedures) but which do not identify individual physicians. Whereas Gruber and Rodriguez find physicians earning slightly more from uninsured patients for the same procedures on average, we find considerable differences with patient income and across categories of health care.

3. Modeling the Delegated Purchasing Incentive for Insurance

We consider a simple model in which individuals are deciding whether to buy insurance against an accident that can range in severity from 1 to *N*. We assume that an accident of severity *i* occurs with exogenous probability α_i, that it necessitates service s_i, and that the competitive price for this service is p_{C_i}. Given these values, individuals know that the expected competitive price of recovering from an accident is:

$$\mathrm{E}\left[p_C \mid \text{accident} \right] = \sum_{i=1}^{N} \left(\frac{\alpha_i}{\alpha} \right) p_{C_i} \quad \text{where} \quad \sum_{i=1}^{N} \alpha_i \equiv \alpha.$$

To focus on the delegated purchasing incentive, we assume that individuals are risk neutral, ex ante identical (with the exception of household income), and unable to affect the probability or severity of the accident. These assumptions rule out welfare gains from risk sharing, as well as any issues related to adverse selection and moral hazard. However, conditional on an accident occurring, we assume that an individual cannot directly observe its severity. Instead, he must

seek the advice of an expert, who will exploit search costs and rationally charge him the ex post monopoly price, p_{M_i} (see, for example, Diamond (1971)). Consequently, individuals know that if they are in an accident, they can expect to pay:

$$\mathrm{E}\left[p_M \mid \text{accident} \right] > \mathrm{E}\left[p_C \mid \text{accident} \right].$$

Insurance contracts can eliminate this holdup problem. Because insurance companies employ experts, they always pay the competitive price, and their expected profits are given by:

$$\Pi = p_I - \alpha \mathrm{E}\left[p_C \mid \text{accident} \right] - c,$$

where p_I is the insurance premium they collect from individuals, and c is the administrative cost associated with offering insurance. Note that when profits are positive, the insurance is actuarially unfair when calculated using the competitive price for each service. However, it may still be cheaper than the expected cost of the ex post monopoly price for each service.

A risk-neutral individual with household income y should buy insurance when:

$$\begin{aligned} EU(\text{insured}) - EU(\text{uninsured}) &> 0 \\ \left(y - p_I\right) - \left(\left(1-\alpha\right)\left(y\right) + \left(\alpha\right)\left(y - E\left[p_M \mid \text{accident} \right]\right)\right) &> 0 \\ \alpha E\left[p_M - p_C \mid \text{accident} \right] &> \Pi + c. \end{aligned}$$

The greater the difference between the ex post monopoly price and the competitive price, the more value that is created by delegating purchasing to the insurance company.

Because we are studying prices for medical services, we need to allow for the possibility that uninsured individuals with lower levels of income are more likely to receive uncompensated care. Let $\delta_i(y)$ be the probability that an uninsured individual i with income y has to pay the ex post monopoly price, and let $1-\delta_i(y)$ be the probability that he receives uncompensated care. Now, a risk-neutral individual should buy insurance when:

$$\alpha\left(E\left[\delta(y)p_M - p_C \mid \text{accident}\right]\right) > \prod + c \quad \text{where} \quad E\left[\delta(y)p_M \mid \text{accident}\right] \leq E\left[p_M \mid \text{accident}\right].$$

Allowing the expected ex post monopoly price to increase with household income has two implications. The first is that high-income individuals will benefit more from delegated purchasing than low-income individuals, who are eligible to receive uncompensated care. Therefore, even in a population of risk-neutral individuals, we expect that demand for health insurance will increase with household income. The second implication is that the prices paid by uninsured individuals with low income may be downward biased estimates of the counterfactual prices that would have been paid by uninsured individuals with high income. Our prior is that this will be a bigger issue when expensive services are provided before payment is collected (e.g., hospitalizations and emergency department visits), than when payment is collected before services are provided (e.g., drug purchases and office visits).

Another way to extend the model is to allow for market power among insurers and providers. This significantly complicates matters, as prices become the subject of negotiation. Provider market power can prevent insurers from obtaining the competitive price. Indeed, a provider in a monopoly position (e.g., a patented drug with no substitutes or the only medical specialist in a geographic area) could obtain the monopoly price from both the insured and uninsured, and it is plausible that the latter might be lower. Health care providers who offer discounts based on ability to pay are of course engaging in (arguably well intentioned) price discrimination. As with uncompensated care, discounts for the uninsured with low ability to pay are not necessarily obtainable by those with high ability to pay, and thus a comparison of prices paid by the insured and uninsured may understate the benefits of expert buying for a given client.

Market power for insurers can offset provider market power. Because we do not know which insurance company covers each individual, we cannot distinguish between the negotiated

prices paid by different insurance companies. Therefore, in the empirical work below, we are comparing the average prices paid by uninsured and insured individuals to the average negotiated prices paid by insured individuals. This difference measures the average benefit of delegated purchasing in our sample.

4. Prescription Drugs

A. Data and Empirical Strategy

To estimate the benefit due to delegated bargaining, we rely on data from the Household Component of the Medical Expenditure Panel Survey (MEPS). It is a large, annual survey that asks individuals about their use of health care and then supplements their answers with detailed data from health care providers. These data are collected by the Agency for Healthcare Research and Quality and are intended to provide nationally representative estimates of health care expenditures and insurance coverage. The survey is a rotating panel, using a sub-sample of the households who have participated in the National Health Interview Survey in the prior year; households are interviewed five times across two calendar years. Low income and minority households are over-sampled.[3] Interviewers seek permission to contact medical providers in order to obtain more detailed payment information about medical encounters. We pool data for the 2001 through 2008 survey years and, when studying drug prices, limit ourselves to observations with completed Medical Provider Components.

We aim to identify any differences in payments made by individuals who are uninsured, as compared to those who are privately insured and, therefore, potentially benefiting from negotiated prices. Ideally, we would compare the prices that are charged for identical products across insured and uninsured consumers. In health care, the "product" may vary, even for patients who

[3] We present results that are unweighted. However, when we run our analysis using sampling weights, our results that are statistically indistinguishable from the unweighted results.

are being treated for the same illness by the same provider. Individuals who are hospitalized for the same illness for the same length of stay, for example, may experience different procedures or otherwise different levels of intensity of care. As a result, finding that the uninsured patient paid less for a hospitalization may indicate that they received lower intensity of care or it could indicate that they paid a lower price for the same care. In order to overcome this difficulty, we focus the first part of our analysis on prescription drugs, which are identified in the data by NDC codes. These eleven-digit codes uniquely identify each product, ensuring that we are comparing purchases of the same drug, produced by the same manufacturer, at the same strength and dosage, and in the same form and packaging. These detailed codes ensure that we are identifying the effect of insurance status, instead of unobserved differences in the products. And, because drugs must be paid for before they can be used, focusing on drug prices reduces concerns that uninsured individuals benefit from uncompensated care.

In order to make the comparison between insured and uninsured individuals as clean as possible, we restrict our sample in several ways. First, we exclude individuals who are publicly insured from our sample, because public insurers often pay relatively low prices, but not through explicit negotiation with providers. This filter excludes the vast majority of individuals aged 65 and older, as well as many of the lowest income individuals. Second, we exclude individuals who change insurance status over the course of the calendar year. Third, we exclude any uninsured individuals who do not pay for their own medical care. Data on payments indicate that approximately 20% of drugs purchased by uninsured individuals were paid for by other sources, such as the Veteran's Administration; because those sources may also benefit from negotiated rates, we exclude these observations from our uninsured sample. Fourth, we include only observations for which we have matched household survey and pharmacy records. This restriction

ensures that the payment data comes from pharmacy records, which are likely to be more precise and accurate than individual self-reports. Finally, we include only one observation for each person-prescription combination in each survey year, so that our results are not driven by a small number of patients who purchase a relatively large number of drugs, although results are similar if we do not impose this restriction. The resulting data set includes 80,068 purchases of 11,205 unique prescription drug products.

We report summary statistics for our sample of drug purchases in Table 1. There are several notable patterns. First, privately insured individuals purchase the vast majority (93.4%) of drugs. Second, total drug payments by uninsured individuals are lower than total drug payments by insured individuals ($44.48 versus $58.26). However, this univariate comparison does not control for differences in the sets of drugs being purchased by the two groups. In the regressions below, we measure the difference in total payments for the same drug in the same calendar year. Third, there is little evidence of uncompensated care; even among the uninsured, only 0.02% of drug purchases involve no payments. Finally, while the majority of drugs are purchased from retail pharmacies, uninsured individuals are significantly more likely to purchase drugs from clinics (17.6% versus 6.7%). This prompts us to test for differences in the relative prices that insured and uninsured individuals pay across outlets.

To measure the benefit of delegated purchasing for pharmaceutical drugs, we estimate the following regression equation:

$$(1) \qquad Ln(\text{Payments})_{ipt} = \alpha + \beta \text{Uninsured}_{it} + \theta_{pt} \cdot \text{I(Year)}_t \cdot \text{I(Product)}_t + \varepsilon_{ipt}$$

where $Ln(\text{Payments})_{ipt}$ is the natural log of total payments made for product p purchased by individual i in year t. We include payments made by all sources, including the insurer and the patient. Therefore, we are not capturing simply the difference in out-of-pocket costs for the insured

and uninsured patients, but the difference in total payments. Our use of the natural log of payments implies that we exclude drug purchases with total payments of $0. Because we only observe total payments of $0 for 0.01% of the drug purchases in our sample, dropping them has little impact on our findings. $Uninsured_{it}$ is an indicator variable for whether individual *i* is uninsured in calendar year *t*; this is the independent variable of interest. The coefficient on $Uninsured_{it}$ tells us the average difference in total payments that uninsured individuals made for the prescription drug. To guarantee that we are comparing the same product in the same year, the regression includes a full set of product (NDC code) fixed effects interacted with a full set of year fixed effects. Standard errors are clustered on NDC code.

B. Results

Table 2 shows the results from estimating Equation (1) on our sample of drug purchases. Each column shows the results of a different regression. The first column shows our main result: uninsured individuals, on average, pay 9% more than insured individuals for the identical prescription drug in the same year. Of course, the insured individuals have lower out-of-pocket costs but, collectively, they are paying for the expected cost of the prescription drug, and any other medical services they receive, through their insurance premium. This 9% difference represents the difference between the negotiated and non-negotiated price. This difference may be understated if insurers receive rebates from pharmaceutical companies. Of course, this coefficient tells us only about the average difference. We are also interested in the distribution of differences. Figure 1A plots the distribution of the residual from a regression of drug payments (measured in Ln(Dollars)) on drug*year fixed effects. The figure shows that, at every part of the distribution, uninsured patients pay more than their insured counterparts.

The remainder of Table 2 examines heterogeneity in the difference in prices. The second

column looks for differential effects by the income level of the purchaser. If sellers use income to price-discriminate among the uninsured population, then insurance could provide larger benefits—from negotiated prices, at least—to higher income households. To investigate this question, we interact our indicator for being uninsured with dummy variables for "Middle Income" (200-300 percent of the federal poverty line) and "High Income" (greater than 300 percent of the federal poverty line). Interestingly, we find no evidence of such price discrimination in this section of the analysis; we cannot reject the hypothesis that uninsured individuals of all income levels pay the same higher prices for prescription drugs.

We also examine heterogeneity by the place of purchase. The second two columns provide results for prescription drugs purchased in a retail pharmacy. The estimated price differences for retail pharmacies are slightly higher than those in the overall sample, whereas the estimated price differences in clinics are quite different. At clinics, the price paid by uninsured patients is statistically indistinguishable from the price paid by privately insured patients, with a point estimate that is close to zero. These findings suggest that clinics provide discounts to uninsured patients that are comparable to those that they would receive if they were insured. The results for on-line and mail-order clinics are more ambiguous; while the point estimates suggest that uninsured individuals pay higher prices, the standard errors are sufficiently large that we cannot reject the null hypothesis that there is no price difference.

In Table 3, motivated by the analysis of Lakdawalla and Yin (2010), we test whether the introduction of Medicare Part D increased the delegated purchasing benefit of private insurance. We interact the Uninsured dummy variable with a dummy variable indicating whether the drug was purchased between 2006 and 2008. (The direct year effects are absorbed by the NDC code*year fixed effects.) Between 2001 and 2005, we find that the uninsured pay 6.5% more

than the privately insured. From 2006 to 2008, we find that the uninsured pay an additional 6.4% more—remarkably similar to the 5.8% decline in prices associated with Medicare Part D that Lakdawalla and Yin (2010) estimate for non-elderly, privately insured prescription drug purchasers, using different data and different identification. One interpretation, since our sample excludes individuals on public insurance programs like Medicare, is that the additional 6.4% measures the spillover to private insurance from the increased bargaining power of insurance companies created by Medicare Part D.[4] Another, potentially complementary, interpretation is that there was a secular increase in insurance company bargaining power over this period. Indeed, when we estimate a more flexible specification, in which we interact our Uninsured dummy variable with year fixed effects, we find that the benefits of delegated purchasing were trending up before 2006. We plot the estimated coefficients and 95% confidence intervals in Figure 2. In the 2001 data, the uninsured paid 2.9% more than the insured, but by 2005, the differential had gradually risen to 9.2%. Nonetheless, there is a discrete increase in the benefits of delegated purchasing in 2007; the estimated benefits of delegated purchasing increase to 16.7% in that year. We further explore the possibility that insurance company bargaining power was trending up over our sample period in Section 5.

Taken together, our findings in this section provide strong evidence that, when we examine identical products, uninsured patients pay prices that are on the order of 10% higher. Of course, we would like to know if these findings are unique to drugs or apply to other types of medical care as well. Therefore, in the next section, we turn to a complementary analysis of the prices that insured and uninsured pay for other medical services.

[4] We find quantitatively similar results when we explicitly limit the sample to individuals under the age of 65.

5. Prices Paid for Other Medical Services

A. Data and Empirical Strategy

The data for this part of the analysis again come from the MEPS. For each individual that receives medical services, we calculate the ratio of the total payments that were made to the billed charges. We then test whether this ratio differs by insurance status by estimating the following equation:

$$\text{Ratio}_{ist} = \alpha + \beta \text{Uninsured}_{it} + \theta_t \cdot \text{I(Year)}_t + \varepsilon_{ist} \quad (2)$$

where $Ratio_{ist}$ is the ratio of total payments to billed charges for individual *i* for service *s* in year *t*. We exclude prescription drug spending from this measure because billed charges are not reported for prescription drugs. We also exclude dental spending and charges, because dental care is usually covered by separate insurance policies. Again, the independent variable of interest is an indicator for whether individual *i* is uninsured in year *t*. All of the regressions include a full set of year fixed effects. When the regression is restricted to a single type of service (e.g., office visits), the dependent variable is calculated using only the payments and billed charges for that type of service; individuals who do not receive the service are dropped.

Since we are no longer able to compare the prices paid for identical products, we view this analysis as being more suggestive, and less cleanly identified, than the analysis of prescription drugs. In particular, in comparing ratios of payments-to-billed-charges across the insured and uninsured, we are using billed charges as a measure of the quantity and quality of care provided. The true value of care provided for a dollar of billed charges can vary, of course, and these differences may be correlated with insurance status. If, for example, doctors intentionally lower the charges on the bills of uninsured patients with the knowledge that those patients would be required to pay a higher percentage of billed charges, we would observe uninsured patients

paying for a larger fraction of their reported charges, when they actually paid the same fraction of the true value of care received. On the other hand, some non-profit hospitals have faced pressure to provide more uncompensated care in order to justify their tax-exempt status, which might generate an incentive to inflate charges for patients who are not expected to pay any of their bills. Since we cannot rule out any of this behavior, we interpret the results of this analysis more cautiously.

Our sample excludes publicly insured individuals, uninsured individuals who do not appear to pay their own bills (if any payments are made), and individuals who change insurance status during the year. We report summary statistics for this sample in Table 4. Again, there are several notable patterns.[5] First, there are more uninsured individuals in this sample; 78% of the patients have private health insurance, while the remaining 22% are uninsured. Second, among the 69.7% of individuals with billed charges, the average ratio of payments to billed charges is 69.2%. This average ratio varies little with insurance status. Third, the ratio of payments to billed charges is highest for office visits (70%) and lowest for hospitalizations (52%). About 1/3 of the payments are for hospitalizations, 1/4 for office visits, 1/4 for prescription drugs, and the remainder for outpatient visits, emergency department visits, and other services.

Within the full sample, 26.9% are classified as "low income" (below 200 percent of the federal poverty line), while 39.1% are classified as "high income" (greater than 300 percent of the federal poverty line). Since we exclude individuals who are covered by Medicaid, our full sample excludes many of the lowest income individuals. Not surprisingly, uninsured individuals are much more likely to be classified as low income (62.9% versus 17.7%), and much less likely

[5] The fact that the average total payment of $2,551 in our sample is lower than the per capita health care costs reported in the National Health Expenditures data is primarily due to characteristics of the MEPS survey. According to Selden and Sing (2008), differences between the MEPS data and National Health Care Expenditure data are due to a variety of factors, such as the exclusion of institutionalized individuals from the MEPS, under-reporting, and differential attrition of high-cost individuals

to be classified as high income (9.9% versus 46.6%). Perhaps because of these differences, the fraction of individuals who receive medical care during the year and pay nothing for that care (or have nothing paid on their behalf.) is 2.1% for the uninsured and 0.1% for the insured. When we classify individuals who receive uncompensated care as those who pay 5% or less of billed charges (2.3% of individuals fall into this category whereas 1.7% of individuals pay none of their billed charges), the fraction increases to 18.1% for the uninsured but only to 0.6% for the insured. In other words, Table 4 highlights the fact that uninsured individuals are much more likely to receive uncompensated care.

B. Results

The results of this analysis are shown in Table 5. Each cell reports the estimated coefficient on the Uninsured dummy variable in a different regression. The set of medical services (and dependent variable) varies across columns. The top panel focuses on the full sample of patients. The bottom panel focuses on patients who are not receiving uncompensated care, which we define as care that is provided in exchange for reimbursement of less than 5% of billed charges. Within each panel, we also report the results of regressions restricted to patients from high-, middle-, and low-income households.

In the first column, the dependent variable is the overall ratio of all non-drug expenditures to all non-drug billed charges. Within the full sample, we estimate that uninsured patients, on average, pay 0.5 percentage points less of their billed charges. However, this pooled estimate masks interesting heterogeneity. When we separate the full sample into high-income, middle-income, and low-income subsamples, we find evidence of price discrimination. The fact that low-income uninsured individuals pay, on average, 1.2 percentage points less of their billed charges than low-income insured patients implies that providers give essentially the same discount to low-income uninsured that they give to insurance companies. Higher income uninsured

individuals, in contrast, pay 10.2 percentage points more of their billed charges than higher income insured individuals, while middle income uninsured patients pays 5.4 percentage points more.

In the bottom panel, we find that this heterogeneity is driven, in part, by the small number of uninsured individuals who receive medical care during the year, but pay little or none of their medical bills (or have paid little or none of their bills at the time that MEPS data were collected).[6] When we also drop the 2.1% of households that pay 5% or less of their billed charges, uninsured in the sample pay 15.3 percentage points more.[7] This result is broadly consistent with our findings in the more cleanly identified prescription drug analysis where, again, virtually every drug purchaser paid something towards their prescription drugs and the uninsured paid, on average, 9% more. Among high-income households, the difference grows to 19.0 percentage points. This highlights the fact that the delegated purchasing benefits from health insurance are stronger for higher income individuals than for lower income individuals, who are more likely to receive uncompensated care.

Figure 3A provides additional evidence on the distribution of the delegated purchasing benefits of private health insurance. It suggests that about 70% of uninsured individuals pay a larger share of their charges than insured individuals. Notably, the median uninsured individual pays 100% of their charges, whereas the median insured individual pays (or has paid on his behalf) only 71% of the billed charges. Therefore, even if uninsured individuals pay the same frac-

[6] In unreported regressions, we find that the fraction of billed charges increases by about 2 percentage points when we compare medical services received at the beginning and end of the survey period, but we find no evidence of a differential trend for the uninsured.

[7] If we use a stricter definition of "uncompensated care" and drop only the 1.7% of patients who pay none of their billed charges, we find that the insured—if they pay anything at all—pay 12.5 percentage points more of the billed charges than do insured patients. If we instead drop all patients who pay less than 10% of billed charges, we find that the uninsured pay 16.9 percentage points more of their billed charged charges than do insured patients.

tion of billed charges on average, they face much greater uncertainty about the size of the payment they will ultimately be required to make. Figure 3B shows the distribution of the ratio for high-income insured and uninsured patients and, again, highlights the fact that higher income individuals derive a particularly large price benefit from purchasing health insurance.

The remaining columns of Table 5 examine several key components of costs: office visits, outpatient visits, hospitalizations, and emergency department visits. There is substantial heterogeneity across types of care, with uninsured individuals typically paying a smaller fraction of their billed charges in hospitals and emergency departments, but about 20 percentage points more of their billed charges in office and outpatient visits. This heterogeneity may, in part, reflect legal differences; some states, including California and New York, have passed laws aimed at reducing the hospital prices faced by uninsured patients. However, because our data do not include state identifiers, we are unable to assess the relative importance of such laws.

In Table 6, we extend the tests for changes in insurance bargaining power in the years 2006 to 2008 to the prices paid for non-drug medical services. Our prediction, given the evidence of spillovers to private insurance from the introduction of Medicare Part D in Lakdawalla and Yin (2010), is that the coefficient on the interaction between the Uninsured dummy variable and the 2006-2008 dummy variable will be zero for these other forms of medical care. Surprisingly, we find strong evidence that the relative prices paid by the insured fall for a wide range of medical services. This is especially true when we exclude the small fraction of households that pay less than 5% of their billed charges. In this setting, we also find (unreported) evidence that there were pre-existing trends in the benefits of delegated purchasing. These findings suggest that insurance company bargaining power increased during our sample period, at least in part for reasons unrelated to the introduction of Medicare Part D. Such an increase in bargaining power

may reflect the recent increases in concentration in health insurance markets that were documented in Dafny, Duggan, and Ramanarayanan (2009).

6. Summary and Policy Implications

Our paper contributes to the literature on insurance in two ways. First, we highlight the fact that insurance provides an incentive-compatible means of engaging the services of an expert buyer. Second, we demonstrate that the discounts obtained by insurance companies are economically meaningful. When we study drug prices, we find an average discount of approximately 10%. When we study the prices paid for other medical services, such as doctor's office and hospital outpatient visits, the average discount is even larger. The interesting caveat is that the benefits of negotiated prices disappear when uninsured individuals can expect to receive uncompensated care. However, this caveat is unique to health insurance, where perceived duties to treat uninsured individuals create an ability to negotiate payments for expensive medical services that have already been delivered.

Insurers are likely better buyers of services than other expert buyers, like concierges or securities brokers, because they face strong incentives to minimize costs. The delegated-purchasing view of insurance that we discuss in this paper is arguably a useful lens for viewing recent changes and proposals in health insurance. For example, Medicare Part D prescription drug plans are privately administered, but premia paid by participants cover only 10 percent of costs.[8] Medicare provides 80-percent reinsurance for high-cost enrollees, and up to 80-percent risk-sharing for especially high or low plan-level costs. While this cost sharing is intended to mute plans' incentives to screen high-cost participants, it may have the unintended consequence

[8] For fiscal year 2010, Medicare Part D premia totaled $6.5 billion and total expenditures totaled $64 billion (2011 Annual Report of the Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds, Table V.E3). The difference was mostly covered by Federal and State government contributions.

of muting their incentives to negotiate low prices.

Incentives for negotiation are also potentially undermined by the trend towards self-insurance by employers. The share of covered workers in self-insured plans has increased from 44% to 60% from 1999 to 2010 (Kaiser-HRET, 2011, Exhibit 10.1). Insurers typically negotiate the same prices on behalf of both their fully and self-insured plans. When an employer shifts to self-insurance, it weakens the incentives of the insurer to cost minimize, thus potentially creating a negative externality for other employers.[9] While insurers purchasing on behalf of self-insuring employers may still face incentives for cost minimization from repeated interaction and reputational concerns, these are clearly weaker than the incentives created by traditional full insurance.[10]

Another form of self-insurance that has expanded recently is high-deductible health plans, which have grown from 4% to 17% of enrollees from 2006 to 2011 (Kaiser-HRET, 2011, Exhibit 8.4). In these plans, households are responsible for the first $2,000-$5,000 of expenses, with a median deductible of about $3,500 (Kaiser-HRET, 2011, Exhibit 8.10). Had all households been enrolled in plans with a $3,500 deductable, 38% of households would have failed to meet that deductable, and the average household would have borne 62% of expenditures (using our weighted MEPS data, and adjusting to 2011 dollars using the CPI – Medical Care). Advocates of these plans (e.g., Cogan, Hubbard, and Kessler, 2011) highlight the beneficial incentives they create for consumers to control their own health care costs. Set against this incentive, these plans weaken the price-negotiation incentives for insurers even more than employer self-

[9] Employer self-insurance might be both popular and inefficient, if, for example, it arose from an unraveling of the insurance market, in which employers seeking full insurance were expected to be doing so in expectation of high costs.

[10] Similarly, Mayers and Smith (1982) argue that because the purchase of retroactive liability coverage transfers all of the liability onto the insurance company, it strengthens the insurance company's incentive to negotiate an efficient settlement.

insurance, as individuals have less ability to shift away from plans administered by insurers who negotiate poorly. Whether the benefits of stronger incentives for consumers will offset the weaker cost-minimizing incentives for insurers is an open question; the answer may differ for different types of care, depending on the potential for overconsumption, postponability, and price shopping.

In summary, economists tend to view insurance as a tradeoff between the benefits of risk sharing and the problems of moral hazard, adverse selection, and administrative costs. Without diminishing the importance of any of these factors, we argue that additional insights can be gained by recognizing that insurance is also an incentive-compatible mechanism for delegating purchasing.

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Table 1
Summary Statistics for Sample of Prescription Drug Purchases, 2001-2008

Variable	Full Sample	Uninsured	Privately Insured	Low Income Purchaser	High Income Purchaser
Total payments for drug	$57.35	$44.48	$58.26	$53.08	$60.02
	(80.09)	(52.08)	(81.63)	(102.79)	(76.55)
% with no payment	0.01	0.02	0.01	0.02	0.01
% purchased by privately insured patient	93.4	0	100	81.8	97.7
% purchased by uninsured patient	6.6	100	0	18.2	2.3
% purchased by low income patient	20.9	57.9	18.3	100	0
% purchased by high income patient	45.2	15.6	47.3	0	100
% purchased at retail pharmacy	83.5	76.2	84.0	81.5	83.0
% purchased at clinic	7.4	17.6	6.7	10.9	6.4
% purchased on-line, mail-order or other	7.7	2.7	8.0	6.0	9.2
N	80,068	5,278	74,790	16,769	36,183

Note: Sample excludes individuals in MEPS who are covered by public insurance, or who change insurance status during the year. We describe other filters in the text. Individuals are classified as "low income" when their income is below 200 percent of the federal poverty line in year *t*, and "high income" when their income is above 300 percent of the federal poverty line in year *t*. The type of pharmacy is "not ascertained" for approximately 1.5% of drug purchases. This explains why the % purchased through retail pharmacies, clinics, on-line, and mail-order sums to less than 100%.

Table 2
The Effect of Insurance Status on Ln(Drug Payments)

	Full Sample		Purchased in a Store		Purchased in a clinic		Purchased on-line or mail-order	
Coefficient on Uninsured	0.090**	0.094**	0.101**	0.112**	0.012	-0.001	0.062	0.097
	(0.009)	(0.012)	(0.010)	(0.014)	(0030)	(0.040)	(0.105)	(0.140)
Coefficient on Uninsured * Middle Income		-0.004		-0.013		-0.040		0.059
		(0.016)		(0.019)		(0.086)		(0.205)
Coefficient on Uninsured * High Income		-0.021		-0.040**		0.064		-0.277
		(0.017)		(0.020)		(0.106)		(0.386)
Drug * year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	11,205	11,205	9,772	9,772	2,700	2,700	2,666	2,666
N	80,059	80,059	66,815	66,815	5,905	5,905	6,127	6,127
Mean of Dependent Variable	3.59	3.59	3.59	3.59	3.52	3.52	3.69	3.69
Mean of Drug Payments	$57.35	$57.35	$56.31	$56.31	$55.91	$55.91	$71.51	$71.51

Note: This table shows coefficients (and standard errors) from estimation of Equation (1). Each column shows coefficients from a separate regression. Control variables include a full set of year * NDC code fixed effects. Regressions with interactions between Uninsured and income category also include controls for income category main effects. Standard errors are clustered on NDC code. Coefficients that are statistically significantly different from zero at the 10-percent and 5-percent levels are denoted by * and **.

Table 3
The Effect of Insurance Status on Ln(Drug Payments)

	Full Sample		Purchased in a Store		Purchased in a clinic		Purchased on-line or mail-order	
Coefficient on Uninsured	0.090**	0.065**	0.101**	0.071**	0.012	0.011	0.062	0.035
	(0.009)	(0.010)	(0.010)	(0.012)	(0.030)	(0.036)	(0.105)	(0.034)
Coefficient on Uninsured		0.064**		0.077**		0.003		0.059
* Year is 2006-2008		(0.017)		(0.019)		(0.087)		(0.243)
Drug * year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	11,205	11,205	9,772	9,772	2,700	2,700	2,666	2,666
N	80,059	80,059	66,815	66,815	5,905	5,905	6,127	6,127
Mean of Dependent Variable	3.59	3.59	3.59	3.59	3.52	3.52	3.69	3.69
Mean of Drug Payments	$57.35	$57.35	$56.31	$56.31	$55.91	$55.91	$71.51	$71.51

Note: This table shows coefficients (and standard errors) from the estimation of Equation (1) with an interaction between the dummy variable indicating whether individual i is uninsured in calendar year t with a dummy variable indicating whether calendar year t is 2006, 2007, or 2008. The specification and sample are otherwise identical to those in Table 3. Control variables include a full set of year * NDC code effects. Standard errors are clustered on NDC code. Coefficients that are statistically significantly different from zero at the 10-percent and 5-percent levels are denoted by * and **.

Table 4
Summary Statistics for Sample of Individuals, 2001-2008

Variable	Full Sample	Uninsured	Privately Insured	Low Income Household	High Income Household
% with private health insurance	79.6	0	100	52.3	94.9
% uninsured	20.4	100	0	47.7	5.1
% low income	26.9	62.9	17.7	100	0
% high income	39.1	9.7	46.6	0	100
Age	36.0 (20.2)	31.3 (15.3)	37.2 (21.1)	33.3 (20.3)	39.4 (19.7)
% Male	50.1	56.6	48.4	49.1	50.6
Total annual payments	$2,551 (8,122)	$211 (1,031)	$3,152 (8,993)	$1,832 (7,559)	$3,148 (8,889)
Total drug payments	$519 (1,700)	$71 (494)	$634 (1,872)	$373 (1,434)	$636 (1,948)
Total annual payments, excl. drugs and dental	$1,795 (7,519)	$100 (803)	$2,230 (8,364)	$1,345 (7,008)	$2,170 (8,237)
Total annual charges, excl. drugs and dental	$3,559 (16,166)	$315 (3,314)	$4,391 (17,952)	$2,877 (15,524)	$4,154 (17,267)
Ratio of payments to charges	0.692	0.696	0.691	0.661	0.703

Ratio of office payments to office charges	0.703	0.751	0.700	0.689	0.708
Ratio of outpatient payments to outpatient charges	0.548	0.541	0.548	0.508	0.563
Ratio of ER payments to ER charges	0.557	0.305	0.585	0.467	0.606
Ratio of hospital payments to hospital charges	0.520	0.197	0.528	0.493	0.527
% with positive charges, but no payments	0.5	2.1	0.1	1.3	0.2
% with positive charges, but payments $\leq$ 5%	2.1	18.1	0.6	6.0	0.6
% with no charges	30.3	71.2	19.8	47.6	19.0
N	160,715	32,850	127,865	43,294	62,826

Note: Sample excludes individuals in MEPS who are covered by public insurance, or who change insurance status during the year. We describe other filters in the text. Individuals are classified as "low income" when their income is below 200 percent of the federal poverty line in year *t*, and "high income" when their income is above 300 percent of the federal poverty line in year *t*. In every case, when we calculate the ratio of annual payments to annual charges, we exclude drugs and dental services.

Table 5
The Effect of Insurance Status on Ratio of Amount Paid To Charges

Sample	All Costs (excl. drugs)	Office Visits	Outpatient Visits	Hospitalizations	Emergency Department Visits
Full Sample	0.005**	0.051**	-0.009	-0.330**	-0.277**
20.4% uninsured	(0.003)	(0.003)	(0.013)	(0.018)	(0.007)
	N=111,951	N=104,405	N=22,238	N=8,250	N=16,645
High Income subsample	0.102**	0.129**	0.068**	-0.329**	-0.260**
5.1% uninsured	(0.007)	(0.007)	(0.034)	(0.056)	(0.026)
	N=50,869	N=48,431	N=10,951	N=3,378	N=6,318
Middle income subsample	0.054**	0.073**	0.057**	-0.277**	-0.190**
16.5% uninsured	(0.005)	(0.005)	(0.023)	(0.040)	(0.014)
	N=38,405	N=35,811	N=7,438	N=2,855	N=5,925
Low income subsample	-0.012**	0.042**	-0.022	-0.340**	-0.265**
47.8% uninsured	(0.005)	(0.005)	(0.019)	(0.024)	(0.010)
	N=22,677	N=20,163	N=3,849	N=2,017	N=4,402
Excluding ratio ≤ 0.05	0.153**	0.188**	0.213**	-0.017	-0.022**
19.7% uninsured	(0.003)	(0.003)	(0.014)	(0.030)	(0.009)
	N=109,588	N=102,549	N=21,814	N=8,056	N=15,561
High Income sample	0.190**	0.208**	0.235**	-0.068	-0.043
4.9% uninsured	(0.007)	(0.007)	(0.037)	(0.084)	(0.032)
	N=50,516	N=48,080	N=10,817	N=3,346	N=6,197
Middle income sample	0.173**	0.189**	0.254**	0.005	0.037**
16.0% uninsured	(0.005)	(0.005)	(0.025)	(0.057)	(0.017)
	N=37,764	N=35,256	N=7,293	N=2,808	N=5,651
Low income sample	0.157**	0.199**	0.220**	-0.013	-0.006
46.4% uninsured	(0.004)	(0.004)	(0.021)	(0.039)	(0.012)
	N=21,308	N=19,213	N=3,704	N=1,902	N=3,713
Mean Ratio in Full Sample	0.692	0.704	0.548	0.520	0.557

Note: This table reports the coefficient (and standard error) on a dummy variable indicating whether individual i is uninsured in year t. The dependent variable is the fraction of the billed price that is paid by individual *i* and, when applicable, individual i's insurance company. Some specifications exclude individuals for which the dependent variable equals 0, or is less than or equal to 5%. Other specifications are restricted to high-income, middle-income, or low-income individuals. All specifications include year fixed effects. Coefficients that are statistically significantly different from zero at the 10-percent and 5-percent levels are denoted by * and **.

Table 6
The Effect of Insurance Status on Ratio of Amount Paid To Charges

Sample	All Costs (excl. drugs)	Office Visits	Outpatient Visits	Hospitalizations	Emergency Department Visits
Full Sample					
Coefficient on Uninsured	-0.009**	0.032**	-0.030**	-0.334**	-0.282**
	(0.003)	(0.003)	(0.015)	(0.024)	(0.009)
Coefficient on Uninsured * Year is 2006-2008	0.040**	0.056**	0.073**	0.009	0.015
	(0.006)	(0.006)	(0.028)	(0.038)	(0.015)
N	111,951	104,405	22,238	8,250	16,645
Excluding ratio ≤ 0.05					
Coefficient on Uninsured	0.111**	0.162**	0.158**	-0.231**	-0.092**
	(0.003)	(0.003)	(0.017)	(0.029)	(0.011)
Coefficient on Uninsured * Year is 2006-2008	0.038**	0.051**	0.124**	0.108**	-0.006
	(0.006)	(0.006)	(0.032)	(0.051)	(0.018)
N	109,993	102,705	21,898	8,147	15,784
Mean Ratio in Full Sample	0.692	0.704	0.548	0.520	0.557

Note: This table reports coefficients (and standard errors) from the estimation of Equation (2) with an interaction between the dummy variable indicating whether individual i is uninsured in calendar year t with a dummy variable indicating whether calendar year *t* is 2006, 2007, or 2008. The specification and sample are otherwise identical to those in Table 5. Coefficients that are statistically significantly different from zero at the 10-percent and 5-percent levels are denoted by * and **.

Figure 1A

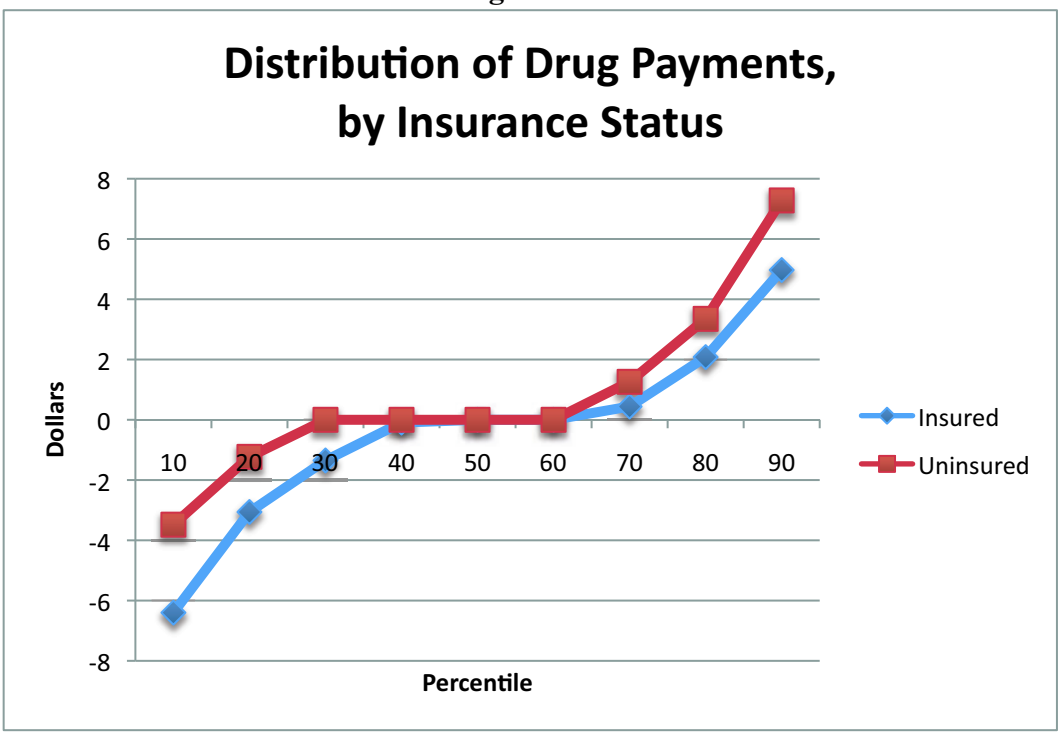

Figure 1B

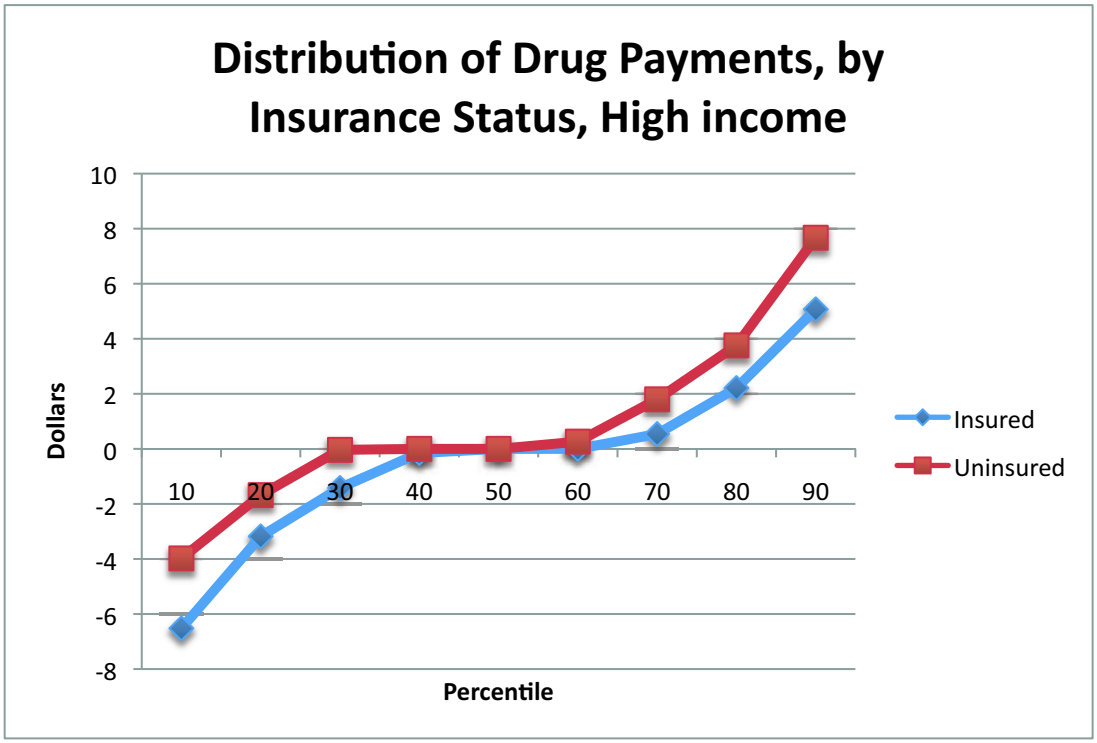

Figure 2

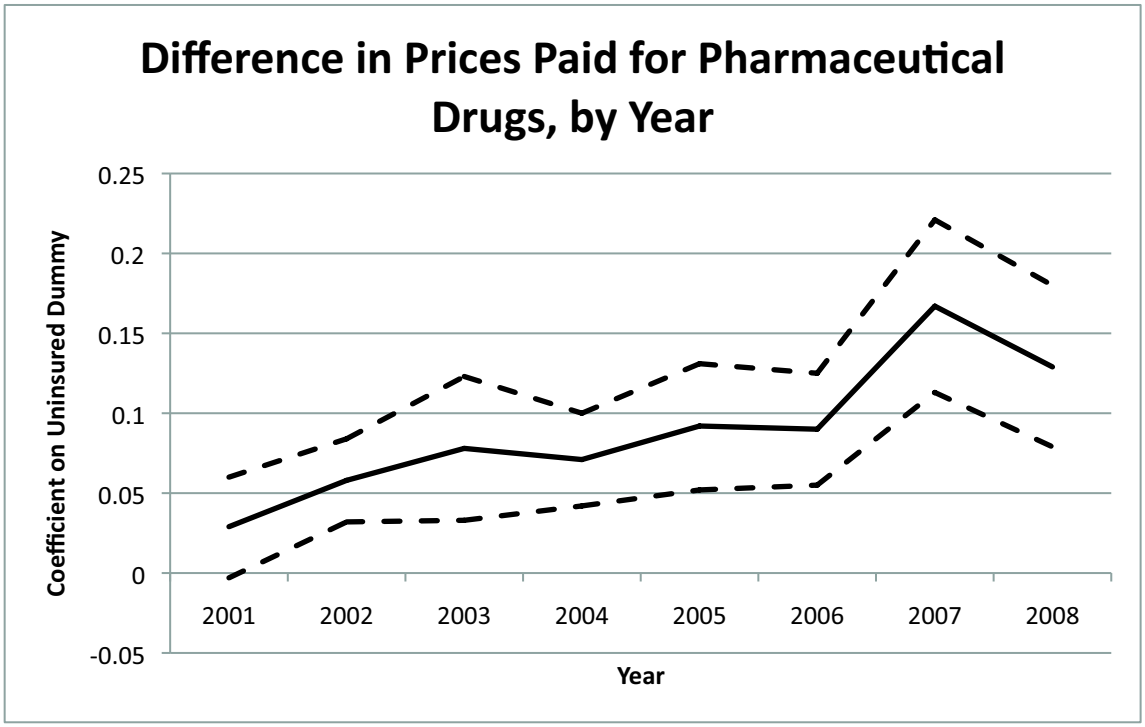
Difference in Prices Paid for Pharmaceutical Drugs, by Year
Coefficient on Uninsured Dummy
0.25
0.2
0.15
0.1
0.05
0
-0.05
2001
2002
2003
2004
2005
2006
2007
2008
Year

Figure 3A

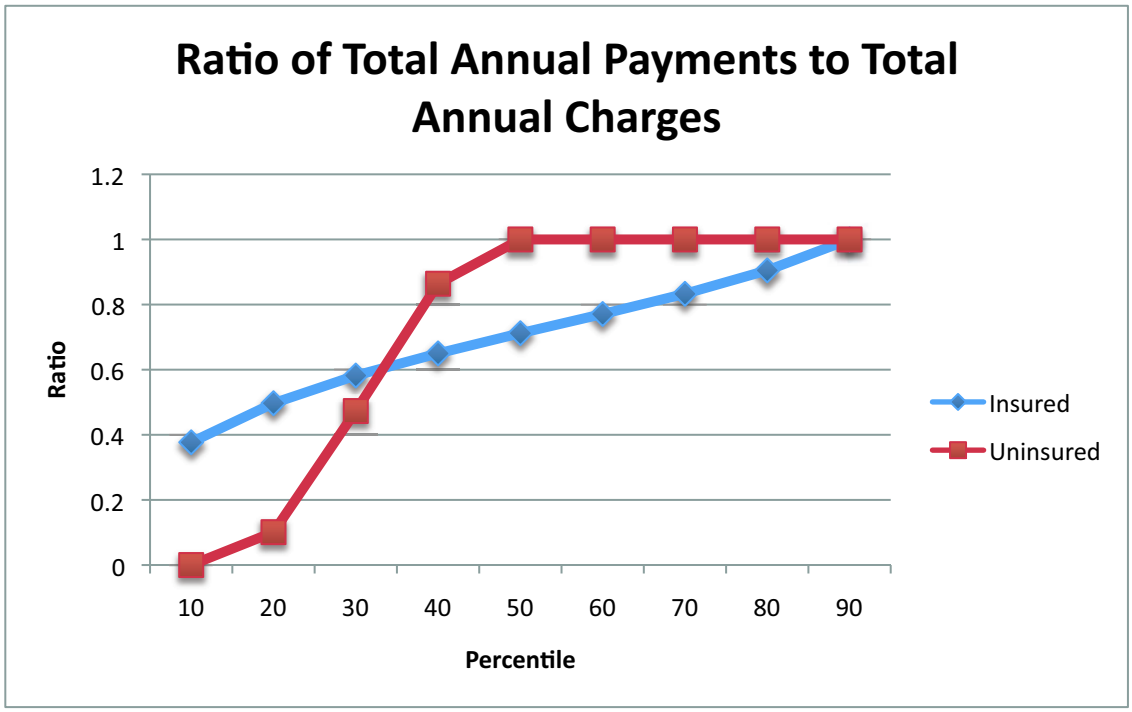

Figure 3B