

Incidence of Drug Price Regulations

Genna Liu*

Thomas Yu†

October 20, 2026

[Click here for latest version](#)

Abstract

Prescription drug prices are determined through a chain of interactions among manufacturers, insurers, and consumers. A regulator seeking to lower drug prices must choose which point in the chain to regulate and which drugs to target. How are the effects of drug price regulations distributed among market participants, and how does that guide a regulator's preferred choices? We develop a model of a drug market with rebate bargaining and community-rated premiums. On the one hand, a net price ceiling transfers surplus from manufacturers to insurers. On the other hand, a copay cap reaches drug users directly, and insurers and manufacturers split its cost according to bargaining power. Beyond that, consumers are affected only through premiums, which only move when drug users are marginal enrollees. A consumer-welfare-maximizing regulator should cap copays, while a spending-minimizing regulator can use either instrument. Copay caps should target drugs with high out-of-pocket prices, many users, and elastic utilization. Net price ceilings should target drugs with high net spending. Applied to insulin in Medicare Part D, the model implies that Medicare's \$35 insulin copay cap raised fills by 3%, at a cost borne by insurers and manufacturers rather than by other consumers.

*Yale University, genna.liu@yale.edu

†Yale University, t.yu@yale.edu

1 Introduction

High prescription drug spending is one of the most visible sources of financial strain in the United States health care system. According to the Centers for Medicare & Medicaid Services (CMS), consumers and insurers spent a combined total of \$406 billion, or \$1,200 per American, on retail prescription drugs in 2022 (CMS, 2023b). The prices behind that spending are determined through a chain of interactions among manufacturers, insurers, and consumers. Manufacturers set list prices. Insurers, usually through pharmacy benefit managers, negotiate rebates that determine the net prices they pay. Consumers pay premiums for insurance coverage and out-of-pocket prices for drug purchases.

A regulator seeking to lower drug prices must therefore choose which point in this chain to regulate and which drugs to target. For example, out-of-pocket prices are frequently regulated, especially for insulin: Medicare has capped insulin copays at \$35 since 2023 (CMS, 2023a), and 29 states cap insulin copays for state-regulated commercial insurers (ADA, 2026). Prices that insurers pay manufacturers are often regulated as well. The Medicare Drug Price Negotiation Program sets maximum fair prices which, starting in 2026, constrain prices paid by Medicare for a set of high-spending drugs (CMS, 2024). Similarly, Medicaid’s most-favored-nation pricing program was launched in 2026 and benchmarks Medicaid prices for participating drugs based on prices in other countries (CMS, 2026). Because each of these regulations indirectly impacts the rest of the chain, equilibrium effects on market participants are difficult to predict, and headline numbers can mislead: the Drug Price Negotiation Program’s first maximum fair prices were 62% below list prices, yet CMS estimates that they only lowered net spending by 22% because rebates had already captured most of the difference.

In this paper, we ask two related questions. First, how are the effects of drug price regulations distributed among consumers, insurers, and manufacturers? Second, how does that guide a regulator’s preferred choices of policy instrument and targeted drug? The answers depend on market structure and on demand: the relative bargaining power of insurers and manufacturers, insurers’ market power in setting premiums, which consumers are marginal to their plans, how many patients would pay list prices without coverage, and how elastic demand is at the pharmacy and in the cash market.

We study these questions in a model with one manufacturer of a drug, one insurer (which we then extend to multiple competing insurers), and two types of consumers: users of the drug and non-users. The list price of the drug is taken as exogenous, and the manufacturer and insurer bargain over the rebate and resulting net price. The insurer sets one community-rated premium for all consumers, and out-of-pocket prices are determined by an exogenous copay. Consumers choose whether to enroll in insurance, and users choose whether to purchase the

drug. The effect of any policy on a particular market participant can be decomposed into a *direct* channel (changes in prices and quantities with the rebate and premium held fixed), a *premium* channel (equilibrium effects due to premium changes), and a *bargaining* channel (equilibrium effects due to rebate changes). We focus on two policy instruments: a copay cap and a net price ceiling, a cap on the price insurers pay after rebates.

The two instruments have different incidences. List price regulation affects uninsured patients directly, through the price they pay out of pocket, but affects insured patients only indirectly through premiums. A regulated list price above the prevailing net price does not bind for rebate negotiations. Because out-of-pocket costs are set exogenously, insured patients are not affected directly. It can affect uninsured patients and the manufacturer through the cash market: if uninsured consumers demand the drug, the regulation lowers the price they pay and changes the manufacturer's disagreement payoff. If the regulated list price is below the prevailing net price, it acts as a net price ceiling, which directly transfers surplus from the manufacturer to the insurer. Consumers benefit from this transfer only through a lower premium, which responds in proportion to drug users' share of *marginal* enrollees due to community rating. When users are inframarginal, as insulin users often are, the savings stay with the insurer.

A copay cut, by contrast, reaches drug users directly, and its cost is shared by the insurer and manufacturer. We show that the bargained net price equals the manufacturer's marginal cost, plus its cash-market outside option per insured fill, plus a share $1 - \eta$ of the joint gains from coverage per insured fill, where η is the insurer's relative bargaining power. Copay revenue is part of those joint gains, so a \$1 copay cut lowers the net price by about $1 - \eta$ dollars: bargaining power determines how the firms divide the cost. Non-users pay through premiums only when users are marginal to the plan. That depends on the policy's scope as much as on the drug: users who are inframarginal to coverage are still marginal between competing plans, so a copay cap adopted by one plan is paid by that plan's non-users while a market-wide mandate is not. With insurer market power, a copay cut can reduce total surplus even when production is costless by raising the premium that non-users face.

These incidence results yield simple guidelines for regulators. A regulator maximizing consumer welfare should cap copays, which would reach drug users directly, rather than the price insurers pay, which would mainly benefit insurers. A regulator minimizing drug spending can use either instrument: a net price ceiling lowers spending directly, and a copay cap lowers it through bargaining when demand is inelastic. For copay caps, the most effective drugs to target are those with high out-of-pocket prices, a large user base, and elastic utilization. For net price ceilings, the most effective drugs to target are those with high net spending, rather than gross spending. This highlights the shortcoming in the Drug Price Negotiation Program's

selection rule, which ranks drugs by gross spending: if a drug's high gross spending is already offset by large rebates, a price ceiling may have no effect.

We apply the model to the empirical setting of insulin in Medicare Part D. Insulin is clinically essential, produced by three dominant manufacturers ([Knox, 2020](#)), sold through rebate-based formulary contracts, and the subject of many drug affordability policies. Using 2022 Part D claims linked to plan formularies, we document the importance of every step along the pricing chain: the mean insulin fill had a list price of \$664.50 and an out-of-pocket price of \$30.90. We estimate demand for insulin products and calibrate the model to these data, the mean premium of stand-alone plans, the premium pass-through estimates of [Cabral, Geruso, and Mahoney \(2018\)](#), and the utilization response to Medicare's insulin copay cap estimated by [Myerson et al. \(2026\)](#).

Three findings stand out. First, a \$35 copay cap binds for 35% of insulin users. The cap raises their fills by 9.2% and all users' fills by 3.0%, decreases affected users' out-of-pocket costs by \$332 per year, and costs the insurer and the manufacturer \$2.50 each per beneficiary-year. Each dollar of copay removed lowers the bargained net price by about 56 cents, so the manufacturer finances about half of any copay cap through rebates. Across market structures, the manufacturer's share of the cost ranges from 20% to 80% with bargaining power, and non-users' share rises from about 1% to 11% with high premium pass-through and to 44% when users are more marginal enrollees. Second, with competing plans, a copay cap adopted by a single plan raises its insulin-user enrollment by 38% and costs its remaining non-user enrollees \$32 per year, 0.17 of users' gain; a market-wide mandate costs non-users \$5. Third, a net price ceiling transfers almost all of the manufacturer's loss to the insurer, and consumers receive 0.3 cents per dollar of the transfer. In a targeting exercise with archetypal drugs, the drugs a consumer-welfare-maximizing regulator would target and those a spending-minimizing regulator would target differ, and neither ranking follows the Drug Price Negotiation Program's ranking by gross spending.

We validate the model against untargeted. It reproduces the realized savings of the Drug Price Negotiation Program's first round; the premium increases and rise in rebates under the Senior Savings Model, which capped insulin copays for participating Medicare plans; and, after the market-wide \$35 insulin copay cap, the absence of an average utilization response alongside a concentrated response among the most exposed consumers.

Related literature. This paper contributes to three literatures. The first studies bargaining in vertically related health care markets: [Gowrisankaran, Nevo, and Town \(2015\)](#) and [Ho and Lee \(2017\)](#) estimate Nash-in-Nash models of hospital-insurer negotiations, [Collard-Wexler, Gowrisankaran, and Lee \(2019\)](#) provide microfoundations, [Demirer and Rubens \(2025\)](#) char-

acterize the welfare effects of buyer and seller power in vertical chains, and [Ho and Lee \(2026\)](#) model contracting between a pharmacy benefit manager and manufacturers over formulary-contingent rebates. We use this framework to compare regulations applied at different points in the chain and to derive a regulator’s instrument choice and targeting rules.

The second studies pass-through and insurer market power: state benefit mandates raise premiums ([Bailey & Blascak, 2016](#)), Medicare Advantage subsidies pass through incompletely and more so in competitive markets ([Cabral et al., 2018](#)), and insurer consolidation raises premiums ([Dafny, Duggan, & Ramanarayanan, 2012](#); [Decarolis, Polyakova, & Ryan, 2020](#)). We show that under community rating the pass-through of a drug-specific cost equals the pass-through of a uniform cost scaled by drug users’ share of marginal enrollees, an application of the logic of [Weyl and Fabinger \(2013\)](#) that determines whether the pool of consumers pays for targeted benefits.

The third studies prescription drug cost sharing and affordability policy: patients respond to spot prices ([Brot-Goldberg, Chandra, Handel, & Kolstad, 2017](#)), cost sharing among the elderly can raise hospital use ([Chandra, Gruber, & McKnight, 2010](#); [Hsu et al., 2006](#)), price responsiveness varies widely across Part D drugs ([Einav, Finkelstein, & Polyakova, 2018](#)), and insulin copay caps lower out-of-pocket spending with utilization responses concentrated among highly exposed patients ([Giannouchos, Ukert, & Buchmueller, 2024](#); [Myerson et al., 2026](#)). [Duggan and Scott Morton \(2010\)](#) show that Part D’s expansion of insured demand affected drug prices, and [Dafny, Ody, and Schmitt \(2017\)](#) show that copay coupons raise costs by undermining formulary incentives. We add equilibrium premium and rebate responses to this evidence and show why different policies may have varying incidence across market participants.

Outline. Section 2 describes the pricing chain and recent policies and presents motivating facts. Section 3 develops a benchmark model with closed-form incidence. Section 4 presents the full model and characterizes the incidence of each instrument and the role of the list price. Section 5 derives the regulator’s instrument choice and targeting rules. Section 6 applies the model to insulin in Medicare Part D, and Section 7 concludes.

2 Institutional Background and Motivating Facts

2.1 Drug Pricing Chain

Three prices matter along the drug pricing chain, which Appendix Figure [A1](#) summarizes. The *list price*, formally the wholesale acquisition cost, is set by the manufacturer. The *net price* is what the manufacturer retains after the confidential rebates that insurers, typically through

pharmacy benefit managers, negotiate in exchange for formulary placement (Ho & Lee, 2026). The *out-of-pocket price* is what the insured patient pays at the pharmacy; it is set by the insurer's benefit design, as a fixed copay or as coinsurance on each formulary tier. Patients' cost-sharing does not depend on the list price if they face a copay, but may be a share of pre-rebate price if they face a coinsurance. An uninsured patient, or an insured patient whose plan excludes the drug, faces the list price or a pharmacy price derived from it.

2.2 Drug Price Regulation Policies

Several types of policies have been adopted to improve the affordability of prescription drugs, including insulin. The policies mainly fall into two categories: ones targeting the net prices insurers pay manufacturers and ones targeting downstream out-of-pocket payments. Appendix Table A1 maps each policy to the price it regulates and its corresponding model object.

2.2.1 Net Price Regulations

Most-favored-nation pricing. The Trump administration adopted most-favored-nation (MFN) drug pricing, under which the U.S. should pay similar prescription drug prices as other comparable nations (White House, 2025). By early 2026, most major manufacturers had entered voluntary MFN agreements with the administration (Cubanski, 2026). The agreements deliver MFN prices through three channels: rebates to Medicaid under a payment model launched in 2026 (CMS, 2026), a direct-to-consumer cash channel, and launch prices for new drugs. In the Medicaid channel, the agreements regulate the net price Medicaid pays for participating drugs.

Medicare drug price negotiation. The Inflation Reduction Act (IRA) of 2022 granted the Secretary of Health and Human Services the authority to negotiate prices with drug companies for certain high-expenditure, single-source drugs without generic or biosimilar competition covered under Medicare (Cubanski & Neuman, 2026). The program requires CMS to negotiate maximum fair prices for the set of selected drugs, taking into account the drug's clinical benefits and manufacturer-specific data elements. The maximum fair price cannot exceed the lesser of the drug's prior enrollment-weighted net price and a percentage of its average manufacturer price, so it is benchmarked to the net price rather than the list price. If negotiations fail, manufacturers may be subject to an excise tax or can choose to withdraw their drugs from coverage under Medicare and Medicaid to avoid the excise tax. The first ten negotiated prices took effect in January 2026 (CMS, 2024); drugs selected for 2028 include drugs to treat type 2 diabetes, HIV, and prostate cancer.

2.2.2 Out-of-Pocket Price Regulations

State copay caps. Twenty-nine states and the District of Columbia have enacted legislation capping patient out-of-pocket costs for insulin in state-regulated commercial plans ([ADA, 2026](#)). Colorado was among the first, enacting a \$100 monthly copay cap for insulin that took effect in 2020. [Giannouchos et al. \(2024\)](#) find that Colorado’s copay cap increased medication adherence and reduced diabetes-related complications, providing early evidence that out-of-pocket cost reductions can meaningfully improve patient outcomes.

Medicare Senior Savings Model. Beginning January 1, 2021, CMS tested the impact of allowing Medicare Prescription Drug Plans (PDPs) and Medicare Advantage Prescription Drug plans (MA-PDs) to voluntarily cap patient insulin cost sharing at \$35 per month’s supply as a supplemental benefit ([CMS, 2025](#); [Cubanski & Neuman, 2024](#)). Participation was voluntary for plans, and around half of all Part D plans joined. The copay cap did not apply to all products: participating plans only had to cover one of each dosage form and insulin type. The model ran through December 2022 and was superseded by the IRA’s mandatory provisions.

Inflation Reduction Act insulin copay cap. Beginning in January 2023, the IRA mandated that all Medicare Part D plans cap monthly cost sharing for covered insulin products at \$35, with no deductible applying ([CMS, 2023a](#); [Cubanski & Neuman, 2024](#)). Beginning in July 2023, the copay cap also applied to Part B. Prior to the copay cap, the average annual out-of-pocket spending on insulin among Medicare Part D enrollees was \$572 in 2020 ([Cubanski & Damico, 2022](#)); 25% of Part D enrollees spent more than \$800, and 5% spent more than \$1,700. The IRA’s \$35 copay cap is therefore binding for a meaningful share of insulin users. From 2026, the copay cap for a covered insulin product is the lesser of \$35, 25% of its maximum fair price, and 25% of the plan’s negotiated price ([CMS, 2025](#)).

2.3 Three Motivating Facts

Fact 1: List-price discounts overstate net price reductions. Table 1 reports the ten drugs in the first negotiation cycle. Negotiated prices were 38% to 79% below 2023 list prices, and 62% below on a spending-weighted basis. Applied to the drugs’ \$56.2 billion of 2023 gross Part D spending, these discounts would imply a \$34.7 billion reduction. CMS estimates instead that the negotiated prices would have reduced 2023 net spending by \$6 billion, or 22%. The implied baseline net spending is \$27.3 billion, so rebates already amounted to about 51% of gross spending, and only 17% of the headline reduction is a reduction in net spending. This is the pattern the model of Section 4 predicts: what matters is the regulated price relative to the prior *net* price, not relative to the list price.

Table 1: Medicare's First Ten Negotiated Prices: List Discounts versus Net Savings

Drug	Price, 30-day supply (\$)		Discount from list (%)	Gross cost 2023 (\$bn)	Users (000s)	Gross cost × discount (\$bn)
	List (2023)	Negotiated (2026)				
Eliquis	521	231	56	18.3	3,928	10.2
Jardiance	573	197	66	8.8	1,883	5.8
Xarelto	517	197	62	6.3	1,324	3.9
Farxiga	556	178	68	4.3	994	2.9
Januvia	527	113	79	4.1	843	3.2
Entresto	628	295	53	3.4	664	1.8
Stelara	13,836	4,695	66	3.0	23	2.0
Enbrel	7,106	2,355	67	3.0	48	2.0
NovoLog/Fiasp	495	119	76	2.6	785	2.0
Imbruvica	14,934	9,319	38	2.4	17	0.9
All ten			62 ^a	56.2	10,509	34.7
CMS estimate of reduction in 2023 net spending: \$6.0 billion (22%)						

Notes: Data from [CMS \(2024\)](#). List prices are 2023 wholesale acquisition costs. The last column multiplies each drug's gross cost by its list discount; it is the reduction in spending implied if negotiated prices were compared with list prices. ^a Weighted by 2023 gross cost.

Fact 2: The benefits of a copay cap are concentrated where it binds. Using Part D data on 2.86 million insulin users, [Myerson et al. \(2026\)](#) find that the \$35 copay cap reduced average out-of-pocket cost per 30-day supply from \$22.95 to \$18.16 (21%) and within-year variation in out-of-pocket cost by 48%, with no increase in average fills, adherence, or persistence among the full cohort. The effects were concentrated among patients with high baseline costs for insulin: in the top decile of baseline out-of-pocket cost (at least \$58 per supply), the copay cap lowered out-of-pocket cost by \$46.27 (51%) and raised annual fills by 0.8 (8%). The implied arc elasticity of insulin use for highly exposed patients is about 0.16. This is an order of magnitude below product-level elasticities, which include switching among products.

Fact 3: A copay cap shifted costs to manufacturers and to non-users' premiums. Appendix Table [A2](#) reports difference-in-differences estimates from CMS's evaluation of the Senior Savings Model. Insulin users' combined premium and out-of-pocket spending fell by \$199–\$319 per year in 2021–2022. In contrast, manufacturer rebates and coverage-gap discounts rose in both plan types. Non-users' spending rose by \$17–\$24 per year in Medicare Advantage drug plans and by \$30–\$65 in stand-alone plans (PDPs). In PDPs, non-users' out-of-pocket drug spending *fell*, so the entire increase came through premiums, underscoring the importance of considering insurers' premium adjustments in copay cap policies. Participating PDPs also saw insulin-user enrollment rise by 75%–92%, showing that marginal enrollees

include insulin users, the condition under which the model predicts that non-users bear the cost of copay caps.

3 Benchmark Model

We begin with a model simple enough to deliver closed-form incidence. It isolates two dimensions of market structure, the insurer's bargaining power against the manufacturer and its market power over consumers, and it shows that the list price matters only through what patients would pay outside coverage.

3.1 Setup

There is one drug produced by a manufacturer (at zero marginal cost), and one insurer that enrolls a population of potential drug consumers of measure 1. The drug's list price $p > 0$ and copay $c \in [0, p]$ are taken as exogenous. For consumers without drug coverage, the list price is also the cash price. Consumers get i.i.d. health shocks and choose whether to buy the drug after the shock realizes.

Let $D(q)$ be each consumer's ex-ante probability of buying the drug, and $W(q)$ be each consumer's ex-ante expected value (in monetary units) from the drug, as functions of the out-of-pocket price q , which varies by insurance coverage. They are both decreasing in the out-of-pocket price, with $W'(q) = -D(q)$. If the drug is covered, the out-of-pocket price is c paid to the insurer, and the insurer pays the manufacturer the net price k per fill. If not, the out-of-pocket price is p paid directly to the manufacturer.

The manufacturer and insurer bargain over the net price k , equivalently the rebate $p - k$. If they disagree, then the drug is not covered. If they agree, then the drug is covered and the insurer purchases the drug for consumers at the net price. In addition, each consumer pays a premium to the insurer. The premium allows the insurer to extract a fraction α of the consumer's value of drug coverage and pass on a fraction $1 - \alpha$ of its costs. Effectively, the premium distributes welfare between the insurer and consumers, such that the insurer receives a fraction α of total insurer and consumer welfare generated by drug coverage, where $\alpha \in [0, 1]$ reflects the insurer's market power.

Define the coverage surplus net of the insurer's drug cost,

$$S(k) \equiv \underbrace{W(c) - W(p)}_{\text{Value of coverage}} - \underbrace{(k - c)D(c)}_{\text{Insurer drug costs}} . \quad (1)$$

Appendix Table A3 summarizes manufacturer, insurer, and consumer welfare depending on whether the manufacturer and insurer agree or disagree: the insurer's welfare is $\alpha S(k)$ and consumers' is $W(p) + (1 - \alpha)S(k)$.

Define $k^{\max}$ as the highest value of k such that the insurer is willing to agree, and $k^{\min}$ as the lowest value of k such that the manufacturer is willing to agree. They satisfy

$$k^{\max} = c + [W(c) - W(p)]/D(c) \quad (2)$$

$$k^{\min} = pD(p)/D(c) \quad (3)$$

Assume $k^{\min} \leq k^{\max}$ (i.e., there exists a value of k such that the manufacturer and insurer are both willing to agree). Consider two cases of bargaining, corresponding to different levels of the insurer's relative bargaining power:

- Case 1: The manufacturer makes a take-it-or-leave-it offer to the insurer. Thus, it offers $k = k^{\max}$, which is accepted.
- Case 2: The insurer makes a take-it-or-leave-it offer to the manufacturer. Thus, it offers $k = k^{\min}$, which is accepted.

Let $\epsilon_p \equiv -pD'(p)/D(p)$ and $\epsilon_c \equiv -cD'(c)/D(c)$ denote demand elasticities at the list price and at the copay.

3.2 Incidence

We first consider the incidence from changing the list price and copay under the two bargaining cases. Although we consider changes to net prices and copay, the case of list price change is informative in providing intuition on how net prices readjust due to upstream or downstream changes.

Proposition 1 (Benchmark incidence). *Total surplus under coverage is $TS = W(c) + cD(c)$; it does not depend on p or k , and $dTS/dc = cD'(c) \leq 0$. Let k^* denote the bargained net price ($k^* = k^{\max}$ in Case 1, $k^* = k^{\min}$ in Case 2), and consider a net-price cap $\bar{k} \geq k^{\min}$. The incidence of the cap on net price and copay is:*

	Case 1: Manufacturer makes offer	Case 2: Insurer makes offer
$\partial \text{Manufacturer} / \partial \bar{k}$	$D(c)$	0
$\partial \text{Insurer} / \partial \bar{k}$	$-\alpha D(c)$	0
$\partial \text{Consumers} / \partial \bar{k}$	$-(1 - \alpha) D(c)$	0
$\partial \text{Manufacturer} / \partial c$	$cD'(c)$	0
$\partial \text{Insurer} / \partial c$	0	$\alpha cD'(c)$
$\partial \text{Consumers} / \partial c$	0	$(1 - \alpha) cD'(c)$

In Case 1 the cap binds for $\bar{k} < k^{\max}$; in Case 2, $k^* = k^{\min}$, so the cap does not bind. If $\bar{k} < k^{\min}$, the manufacturer withholds the drug from coverage and total surplus falls by $G \equiv [W(c) + cD(c)] - [W(p) + pD(p)]$.

Two features of Proposition 1 reappear in the full model.

First, the net price cap is a pure transfer: it does not change the total surplus since it does not affect drug demand, and it only reallocates the payment $kD(c)$ on covered units.¹ The transfer occurs only under Case 1, where the cap moves $D(c)$ per unit of $\bar{k}$ from the manufacturer to the insurer, who passes a share $1 - \alpha$ to consumers through premiums. Under insurer power (Case 2), the net price already sits at the manufacturer’s outside option, so the cap does not bind. If it is set below $k^{\min}$, the manufacturer withholds the drug and total surplus falls by G .

Second, the copay is the only price with efficiency consequences since it directly affects drug utilization, and its deadweight loss $cD'(c)$ falls on whichever party is not held to its outside option.

The benchmark leaves out what makes drug regulation contentious in practice: insurance enrollment responds to premiums, premiums are community-rated across users and non-users of a drug, and bargaining outcomes are interior. We add these features next.

4 Full Model of a Drug Market

4.1 Environment

We use a model of rebate bargaining, insurance demand, and drug demand, similar to [Ho and Lee \(2026\)](#), to illustrate how policies targeting different points in the drug pricing chain affect prices, enrollment, and welfare. Insurance enrollment and drug purchase probabilities are endogenous: the premium, which depends on the negotiated rebate, influences insurance enrollment decisions, and drug purchase probabilities vary depending on an individual user’s insurance status.

Consumers. A unit mass of beneficiaries consists of a share δ of potential drug users (“users”) and a share $1 - \delta$ of non-users. All beneficiaries choose whether to enroll in insurance, while users additionally decide whether to purchase the drug. Each enrolled user fills a prescription with probability $D(c)$ at copay c and receives expected value $W(c)$ from access to the drug, with $W' = -D$.

¹The effects will be different for drugs covered under coinsurance, which causes patient out-of-pocket costs to depend on the list price.

Consumers choose whether to purchase the drug based on their insurance status: outside insurance, users can buy the drug at the list price p_L with purchase probability $D_0(p_L)$ and value $W_0(p_L)$, $W_0' = -D_0$. We call this the cash market. Its size, $\delta(1 - s_D)D_0(p_L)$, is endogenous: enrollment s_D responds to the premium and to $W_0(p_L)$, so a lower list price both raises purchases per uninsured user and makes going uninsured more attractive. If bargaining fails the drug is not covered and every user faces the cash price. The insurer charges a community-rated premium P . Consumers consider the expected value of drug purchases when choosing insurance, and non-users may still derive value from insurance: all beneficiaries value the plan's other coverage (e.g., from covering other drugs) at g . With logit enrollment shocks of scale $1/\lambda$, enrollment probabilities are

$$s_D = \Lambda(\lambda[g + W(c) - W_0(p_L) - P]), \quad s_N = \Lambda(\lambda[g - P]), \quad (4)$$

where Λ is the logistic function. Consumer surplus per user and per non-user is

$$CS_D = \frac{1}{\lambda} \log(e^{\lambda(g+W(c)-P)} + e^{\lambda W_0(p_L)}), \quad CS_N = \frac{1}{\lambda} \log(e^{\lambda(g-P)} + 1). \quad (5)$$

Firms. Let k denote the net price paid by the insurer to the manufacturer per fill. Equivalently the rebate rate is $r = 1 - k/p_L$, so $k \in [0, p_L]$. Profits are

$$\Pi_I = \underbrace{\delta s_D [P - (k - c)D(c)]}_{\text{Users}} + \underbrace{(1 - \delta)s_N P}_{\text{Non-users}}, \quad (6)$$

$$\Pi_M = \delta \left[\underbrace{s_D (k - m)D(c)}_{\text{Insured users}} + \underbrace{(1 - s_D)(p_L - m)D_0(p_L)}_{\text{Uninsured users}} \right], \quad (7)$$

where $m \geq 0$ is the marginal cost of production and dispensing. Coverage is binary, either covered or not covered; we model negotiation over insulin only and hold the negotiation of non-insulin drugs fixed.

Timing. The model proceeds in four steps:

1. The manufacturer and insurer bargain over k .
2. Under community rating, the insurer sets the premium P to maximize profit.
3. Beneficiaries choose insurance coverage.
4. Users choose whether to fill their prescription.

Instruments and channels. The regulator’s instruments are the copay c and the net price ceiling $\bar{k}$. The list price p_L is a parameter of the environment, and Section 4.4 shows when it matters. Let V denote an outcome of interest (manufacturer profit, insurer profit, and consumer welfare) and x denote a policy lever (copay cap, net price cap). Writing k^* for the equilibrium negotiated net price and $P^*(k, x)$ for the premium given k ,

$$\frac{dV}{dx} = \underbrace{\frac{\partial V}{\partial x}}_{\text{direct}} + \underbrace{\frac{\partial V}{\partial P} \frac{\partial P^*}{\partial x}}_{\text{premium}} + \underbrace{\left[\frac{\partial V}{\partial k} + \frac{\partial V}{\partial P} \frac{\partial P^*}{\partial k} \right] \frac{dk^*}{dx}}_{\text{bargaining}}. \quad (8)$$

The equation shows that a policy lever induces three types of changes to welfare.

1. The *direct effect*, where the change in the copay or the net price ceiling directly impacts welfare or profit, holding premium and rebate constant.
2. The *premium channel*, where the policy lever affects the premium set by the insurer. The term is governed by the insurer’s pass-through rate $\partial P^*/\partial x$, which describes how much of a change in the insurer’s net drug cost is passed to premiums. Under community rating, changes in premiums reflect both changes in costs and changes in the composition of enrollees. When there are multiple insurers, the pass-through rate further captures insurer market power, and with more competition pass-through is closer to full.
3. The *bargaining channel*, where the policy lever impacts the negotiated rebate by changing the insurer’s and manufacturer’s bargaining positions. This channel is governed by the bargaining sensitivity dk^*/dx , which captures how much lever x shifts the negotiated net price and depends on how x moves each side’s gains from agreement and on the bargaining weight η , and by the pass-through of the renegotiated rebate into the premium, $\partial P^*/\partial k$.

In the quantitative analysis we compute the discrete analog: we first change the policy holding the net price and premium fixed, then re-optimize the premium, then renegotiate the net price.

4.2 The Bargained Net Price

In the first stage, the manufacturer and insurer bargain over the net price.

If the manufacturer and insurer reach agreement at net price k , the insurer sets premium $P(k)$, with enrollment shares $s_D(k) \equiv s_D(P(k))$ and $s_N(k) \equiv s_N(P(k))$ of drug users and non-users. Under disagreement, the insurer does not cover the drug and sets the premium P^0 that maximizes profit without drug costs, with enrollment shares $s_D^0 \equiv s_D(P^0)$ and $s_N^0 \equiv s_N(P^0)$ and profit $\Pi_I^0 = P^0[\delta s_D^0 + (1 - \delta)s_N^0]$.

The manufacturer's disagreement payoff is $\Pi_M^0 = \delta(p_L - m)D_0(p_L)$, its profit when users can access the drug only at its list price. The insurer's disagreement payoff is $\Pi_I^0 - \varphi$, where $\varphi \geq 0$ captures any further loss from not covering the drug, such as a formulary requirement or the loss of users' other business, that a one-drug model otherwise omits. We set $\varphi = 0$ in the baseline case; Section 6 calibrates it to external evidence on rebates.

The net price solves

$$k^* = \operatorname{argmax}_{k \in [0, \bar{k}]} (1 - \eta) \log [\Pi_M(k) - \Pi_M^0] + \eta \log [\Pi_I(k) - \Pi_I^0 + \varphi], \quad (9)$$

where η is the insurer's bargaining weight and $\bar{k} \leq p_L$ is any net price ceiling ($\bar{k} = p_L$ if there is none). The joint gains from agreement are

$$\begin{aligned} J(k) &\equiv [\Pi_I(k) - \Pi_I^0 + \varphi] + [\Pi_M(k) - \Pi_M^0] \\ &= \delta s_D(k) [P(k) + (c - m)D(c) - (p_L - m)D_0(p_L)] + (1 - \delta)s_N(k)P(k) \\ &\quad - P^0[\delta s_D^0 + (1 - \delta)s_N^0] + \varphi. \end{aligned} \quad (10)$$

The negotiated net price k is a transfer between the insurer and the manufacturer and does not appear explicitly in J . However, it affects J through the insurer's premium response. Using the insurer's first-order condition for P ,

$$J'(k) = \delta \frac{\partial s_D}{\partial P} P'(k) [(k - m)D(c) - (p_L - m)D_0(p_L)], \quad (11)$$

so J is independent of k only if drug users' enrollment does not respond to the premium or the manufacturer earns the same margin per drug user under agreement and disagreement. Total surplus is $TS = \delta CS_D + (1 - \delta)CS_N + \Pi_I + \Pi_M$.

Lemma 1 (Net price as a surplus share). *Suppose the Nash objective is single-peaked in k and the premium does not respond to k at the optimum ($\partial P^*/\partial k = 0$). Let $Q \equiv \delta s_D D(c)$ denote fills from insured users. Then the unconstrained bargained net price is*

$$k^u = m + \underbrace{(p_L - m) \frac{D_0(p_L)}{D(c)}}_{\text{outside option per fill}} + \underbrace{(1 - \eta) \frac{J}{Q}}_{\text{share of gains per fill}}, \quad (12)$$

and $k^* = \min\{k^u, \bar{k}\}$. When $\partial P^*/\partial k \neq 0$, the last term is multiplied by a factor that converges to one as users' share of marginal enrollees goes to zero.

Equation (12) has a simple interpretation. The manufacturer is paid its marginal cost, plus what it would earn per insured fill by selling in the cash market instead, plus its bargaining

share of the joint gains from coverage per insured fill. Copay revenue $cD(c)$ enters the joint gains: it is paid by patients into the vertical chain and is shared between the parties. This yields a useful approximation. When users are inframarginal and $D_0 = 0$, $J/Q \approx c - m + \bar{\pi}$, where $\bar{\pi}$ collects premium gains per fill that do not depend on c to first order. Hence $dk^u/dc \approx 1 - \eta$: each dollar of copay removed lowers the net price by about $1 - \eta$ dollars. Mapping to the setting of [Horn and Wolinsky \(1988\)](#), the insurer's downstream market power, which determines premium pass-through, affects upstream bargaining outcomes: if pass-through is high, the large enrollment and utilization responses make concessions less costly for the manufacturer, while if pass-through is low, a larger rebate is more costly for it.

4.3 Regulating the Net Price

A net price ceiling $\bar{k}$, a cap on the price the insurer pays after rebates such as Medicare's maximum fair price or a state upper payment limit, constrains the bargain directly.

Proposition 2 (Net price ceiling). *Suppose the Nash objective is single-peaked in k . Then:*

- (i) $k^* = \min\{k^u, \bar{k}\}$. *The ceiling binds if and only if $\bar{k} < k^u$, and when it binds the parties settle at the ceiling: no rebate remains on the drug.*
- (ii) *When the ceiling binds, a \$1 reduction in $\bar{k}$ raises insurer profit by Q , lowers the premium by $\rho \omega_D D(c)$, raises aggregate consumer surplus by $S\rho \omega_D D(c)$, and lowers manufacturer profit by Q less a term of order ω_D from the enrollment the lower premium induces. Here $S = \delta s_D + (1 - \delta)s_N$ is total enrollment, ρ is the premium's pass-through of a uniform per-enrollee cost, and ω_D is users' share of marginal enrollees, both defined in Proposition 5.*
- (iii) *If users are inframarginal ($\omega_D = 0$), the ceiling is a pure transfer of Q per dollar from the manufacturer to the insurer; consumers and total surplus are unchanged.*

Part (i) describes how a binding maximum fair price interacts with rebates: with $\bar{k} < k^u$ the Nash objective is increasing in k below the ceiling, so bargaining stops at $\bar{k}$ and no rebate survives, which is what industry analyses expect ([Milliman, 2024](#)). Because the maximum fair price is benchmarked to the enrollment-weighted *average* net price and plans must cover selected drugs, plans that had negotiated deeper-than-average rebates lose the exclusion threat behind them and their net prices rise to $\bar{k}$; rebates can survive below the maximum fair price only where selected drugs compete therapeutically, a margin absent from our one-drug model.

Parts (ii) and (iii) describe incidence. The insurer gains the full saving at the margin because its premium is already optimal, so re-optimizing it adds nothing to first order; consumers gain only what the insurer passes into the premium, and under community rating that depends on who is marginal.

4.4 The Role of the List Price

The list price is not an instrument in the model, but policies and public discussion are often framed in terms of it. The next result states when it matters.

Proposition 3 (List-price neutrality). *Suppose there is no cash market ($D_0 \equiv 0$, $W_0 \equiv 0$), cost sharing is a fixed copay, and the Nash objective is single-peaked in k . Then:*

- (i) *The unconstrained bargained net price $k^u(c)$ does not depend on p_L .*
- (ii) *For $p_L \geq k^u$, every equilibrium outcome (premium, enrollment, utilization, all profits and surpluses) is independent of p_L . The rebate rate $r^* = 1 - k^u/p_L$ absorbs any change in the list price.*
- (iii) *A reduction in the list price to $\bar{p} < k^u(c)$, whether by the manufacturer or by regulation, lowers the net price to $\bar{p}$ and has the same effects as a net price ceiling $\bar{k} = \bar{p}$. A reduction that leaves $p_L \geq k^u(c)$ has no effect.*

Proposition 3 formalizes why list-price discounts are not savings. The relevant statistic is the gap between the regulated price and the pre-policy *net* price, not the list discount. It also says when a lower list price substitutes for a net price ceiling: only once the list price falls below k^u , and only if no payoff depends on the list price. Neutrality fails whenever some revenue or some patient price is tied to the list price: through cash or uninsured purchases, through coinsurance set as a share of a list-based price, or through statutory formulas indexed to it. Our model has a fixed copay throughout, so coinsurance lies outside it; the cash market is in the model, and Section 6 quantifies it. The next result characterizes the cash-market case.

Proposition 4 (List prices and the outside option). *Suppose there is a cash market and the insurer has all the bargaining power ($\eta = 1$). Then*

$$k^* = m + (p_L - m) \frac{D_0(p_L)}{D(c)}, \quad (13)$$

$$\frac{dk^*}{dp_L} = \frac{D_0(p_L)}{D(c)} \left[1 - \epsilon_0(p_L) \frac{p_L - m}{p_L} \right], \quad \frac{dk^*}{dc} = -(p_L - m) \frac{D_0(p_L)D'(c)}{D(c)^2} \geq 0, \quad (14)$$

where $\epsilon_0 = -p_L D'_0(p_L)/D_0(p_L)$. If cash demand is elastic ($\epsilon_0 > p_L/(p_L - m)$), a lower list price raises the net price. A net price ceiling, which leaves the cash price unchanged, has no such effect.

The deviation from neutrality is governed by $D_0/D(c)$, cash purchases relative to insured fills under disagreement, not by the share of users uninsured in equilibrium, because under disagreement every user faces the cash price. A cash market that looks small can therefore

imply a large outside option when the list price is high: in the calibration of Section 6, a 2% purchase probability at a \$664.50 list price gives $D_0/D(c) = 3.6\%$ and a disagreement payoff equal to 52% of the manufacturer's agreement profit. A net price ceiling leaves the list price, and hence the outside option, unchanged; a lower list price changes the outside option as well, which is why it can move the net price in either direction.

4.5 Regulating the Copay

Under community rating the insurer cannot price users separately. Its first-order condition for P weighs each group's cost by that group's contribution to the marginal change in enrollment.

Proposition 5 (Marginal-enrollee pass-through). *Let $u_D = (k-c)D(c)$ be the insurer's drug cost per enrolled user and $s'_g = \partial s_g / \partial P$. Holding k and the enrollment functions fixed, the premium's response to a change in u_D is*

$$\frac{\partial P^*}{\partial u_D} = \rho \omega_D, \quad \omega_D \equiv \frac{\delta s'_D}{\delta s'_D + (1-\delta)s'_N} = \frac{\delta s_D(1-s_D)}{\delta s_D(1-s_D) + (1-\delta)s_N(1-s_N)}, \quad (15)$$

where $\rho = \partial P^* / \partial \tau$ is the pass-through of a cost τ incurred for every enrollee and the second equality uses the logit. Users' share of marginal enrollees, ω_D , can be far below their population share δ : it tends to zero as $s_D \rightarrow 1$.

A copay cut raises u_D by $D(c) + (k-c)|D'(c)|$ per dollar: the insurer pays the forgone copay on existing fills plus its net cost of induced fills. It also raises users' valuation of coverage, and under the logit the premium effect of that valuation shift also vanishes as $s_D \rightarrow 1$. By the envelope theorem, $\partial CS_D / \partial P = -s_D$, $\partial CS_N / \partial P = -s_N$ and $\partial CS_D / \partial c = -s_D D(c)$. Hence, at a fixed net price,

$$\frac{dCS_N}{d(-c)} = -s_N \frac{dP^*}{d(-c)}, \quad \frac{d[\delta CS_D + (1-\delta)CS_N]}{d(-c)} = \delta s_D D(c) - [\delta s_D + (1-\delta)s_N] \frac{dP^*}{d(-c)}. \quad (16)$$

Corollary 1 (Users gain, pool loses). *Ignoring the valuation shift, a copay cut at a fixed net price raises users' surplus but lowers aggregate consumer surplus if and only if*

$$\delta s_D D(c) < [\delta s_D + (1-\delta)s_N] \rho \omega_D [D(c) + (k-c)|D'(c)|]. \quad (17)$$

If users and non-users are equally marginal ($s_D = s_N$, so $\omega_D = \delta$) and induced fills are negligible, this requires $\rho > 1$. Aggregate consumer losses therefore require users to be disproportionately marginal enrollees or induced use to be costly to the insurer.

Proposition 5 and Corollary 1 reconcile two pieces of evidence. In a single community-rated pool where users have large coverage value, the cost of a copay cut is borne mostly by

the insurer and, through bargaining, by the manufacturer. When plans compete and users sort toward generous plans, users become marginal to each plan and the premium rises for everyone in the plan. The Senior Savings Model is a case of the second kind: insulin-user enrollment in participating PDPs rose by three-quarters or more, and non-users' premiums rose (Appendix Table A2). Section 6.9 extends the application to competing plans and shows that the same proposition, applied plan by plan, reproduces this pattern for a plan-level copay cap but not for a market-wide mandate.

4.6 Efficiency with Insurer Market Power

In the benchmark model, a lower copay always raised total surplus when production is costless. With insurer market power over enrollment, this need not hold.

Proposition 6 (Total surplus and the copay). *Let $\Omega_D \equiv P + (c - m)D(c) - (p_L - m)D_0(p_L)$ denote the payment to firms from an additional user enrollee that the enrollee does not internalize. Then*

$$\frac{dTS}{dc} = \underbrace{\delta s_D (c - m) D'(c)}_{\text{utilization}} + \underbrace{\delta \frac{\partial s_D}{\partial c} \Omega_D}_{\text{user enrollment}} + \underbrace{\left[\delta s'_D \Omega_D + (1 - \delta) s'_N P \right] \frac{dP^*}{dc}}_{\text{premium distortion}}, \quad (18)$$

where dP^*/dc is the total premium response, including the effect of renegotiation. The net price affects total surplus only through the premium.

The first two terms are the familiar gains from lower cost sharing: more valuable use and more user enrollment. They are positive for a copay reduction when $c > m$ and $\Omega_D > 0$. The third term is a second-best effect. The premium exceeds the social cost of covering a non-user (zero here), so enrollment is already too low. A copay cut that raises the premium ($dP^*/dc < 0$) pushes further marginal non-users out, reducing surplus. The total-surplus-maximizing copay can therefore exceed marginal cost even without moral hazard, whenever pass-through to marginal enrollees is large. Because the net price enters total surplus only through the premium, a net price ceiling changes total surplus only by the enrollment it induces, which is why Proposition 2(iii) calls it a pure transfer when users are inframarginal.

4.7 What Changes Relative to the Benchmark

The benchmark of Section 3 suggests that consumers gain most from a lower upstream price; the full model reverses this. Comparing instruments requires a common yardstick, since a dollar off an upstream price and a dollar off a copay are not comparable policies. We use the consumer surplus delivered per dollar of rent extracted from the manufacturer,

$$R \equiv \frac{\Delta CS_A}{-\Delta \Pi_M}, \quad (19)$$

the relevant trade-off when manufacturer profit has a shadow value through innovation or participation. A net price ceiling delivers $R = S\rho\omega_D/(\delta s_D)$ and a copay cap delivers $R = 1/[\kappa - (k - m)|D'(c)|/D(c)]$, with κ defined in Section 5. Appendix Table A5 evaluates both at maximum stringency. In the benchmark, consumers capture essentially all of the manufacturer's rent through the upstream price ($R = 1.00$ and 1.25 in the two protocols) and almost nothing through the copay. In the calibrated model the ranking inverts: driving the price insurers pay to zero removes \$11.38 per beneficiary-year from the manufacturer, of which consumers receive \$0.04, while eliminating the copay delivers \$10.79 to consumers at a cost of \$5.15 to the manufacturer, so $R = 2.10$.

Two features of the benchmark account for the difference. Its upstream price works through a large cash margin, which our baseline sets to zero, and its premium mechanically returns a share of any surplus to consumers, whereas in the full model the premium responds to a drug-specific cost only in proportion to users' share of marginal enrollees. Appendix B.2.2 develops both.

5 The Regulator's Choices

We now turn the incidence results into a regulator's problem. The regulator chooses an instrument, a net price ceiling or a copay cap, and the drugs to which it applies. We consider three objectives: aggregate consumer surplus $CS_A = \delta CS_D + (1 - \delta)CS_N$, net drug spending $\Pi_M + mQ$ (payments to the manufacturer), and total surplus. Because $TS = CS_A + \Pi_I + \Pi_M$, the objectives differ only in how they weight the three parties. Their rankings of instruments and drugs are therefore fully determined by incidence.

To obtain transparent rules, we study the case in which drug users are inframarginal enrollees, as in our calibration.

Assumption 1 (Inframarginal users). *There is no cash market, and users' enrollment is locally insensitive to the premium and the copay: $\partial s_D/\partial P = \partial s_D/\partial c = 0$.*

Under Assumption 1, $\omega_D = 0$ and the premium does not respond to users' costs (Proposition 5). Define the insurer's gain from agreement per enrolled user, net of drug costs, $B \equiv (SP - \Pi_I^0 + \varphi)/(\delta s_D)$, where $S = \delta s_D + (1 - \delta)s_N$ is total enrollment.

Proposition 7 (Incidence of marginal regulation). *Under Assumption 1:*

- (a) Net price ceiling. *By Proposition 2(iii), a binding net price ceiling that lowers the net price by \$1 per fill transfers Q from the manufacturer to the insurer and leaves consumers and total surplus unchanged.*

(b) Copay cap. A \$1 copay reduction, with the net price renegotiated, lowers the net price by

$$\kappa \equiv \frac{dk^*}{dc} = (1 - \eta) \left[1 + \epsilon_c \frac{B}{cD(c)} \right] \text{ dollars}, \quad (20)$$

and changes payoffs by

$$\begin{aligned} \Delta CS_A &= Q, & \Delta \Pi_M &= -\kappa Q + (k - m) \delta s_D |D'(c)|, \\ \Delta \Pi_I &= -(1 - \kappa)Q - (k - c) \delta s_D |D'(c)|, & \Delta TS &= (c - m) \delta s_D |D'(c)|. \end{aligned}$$

(c) Targeting. A net price ceiling at a fraction θ of the list price reduces net spending by $G(1 - r - \theta)^+$, where $G = p_L Q$ is gross spending at list prices and r the rebate rate. A copay cap at $\bar{c} < c$ raises consumer surplus by

$$\delta s_D \int_{\bar{c}}^c D(q) dq = \underbrace{Q(c - \bar{c})}_{\text{exposure} \times \text{fills}} + \underbrace{\delta s_D \int_{\bar{c}}^c [D(q) - D(c)] dq}_{\text{utilization response}}. \quad (21)$$

Proposition 7 delivers the regulator's choices.

Instrument choice. A consumer-welfare regulator prefers the copay cap. It passes each dollar of price reduction to consumers, while a net price ceiling passes consumers only $S\rho \omega_D/(\delta s_D)$ per dollar taken from the manufacturer (Proposition 2(ii)). That share is zero when users are inframarginal and rises with premium pass-through and with users' share of marginal enrollees. A spending-minimizing regulator can use either instrument. A ceiling lowers spending by Q per dollar. A copay cap lowers spending by $\kappa Q - (k - m) \delta s_D |D'(c)|$ per dollar, which is positive unless utilization is elastic relative to the manufacturer's bargaining share $1 - \eta$. Market structure enters through η , which divides a copay cut between insurer and manufacturer, and through B , the insurer's gain from agreement per user. When $\epsilon_c B/(cD) > \eta/(1 - \eta)$, then $\kappa > 1$ and the insurer gains from a copay cut: the manufacturer concedes more on the net price than the insurer loses in copay revenue.

Which drugs. Equation (21) states that a consumer-welfare regulator using a copay cap should target drugs with high consumer price exposure $c - \bar{c}$ above the cap, many insured fills Q , and a large utilization response. It should not target drugs by list price. A spending regulator using a ceiling should target drugs with high gross spending *and* shallow rebates, since savings are $G(1 - r - \theta)^+$. A drug with the highest gross spending but a rebate deeper than $1 - \theta$ yields no savings at all. Medicare's selection rule ranks eligible drugs by gross spending (Cubanski

& Neuman, 2026), and so omits the rebate term. The total-surplus regulator values neither transfer. It targets copay caps where the utilization response is valuable, $(c - m)\delta s_D |D'(c)|$, and is indifferent to price ceilings under Assumption 1.

6 Application: Insulin in Medicare Part D

6.1 Insulin

Insulin is essential for patients with type 1 diabetes and many patients with type 2 diabetes, with no therapeutic substitute for those who require it.

Products. Insulin products differ along two dimensions. First, products differ in *delivery method*: insulin is administered either via vial-and-syringe or via prefilled pen. The two formats are imperfect substitutes, and patients often consult a provider to determine the format that best suits their lifestyle, comfort, and clinical requirements. Second, products differ in *pharmacokinetic profile*, including the onset, peak time, and duration. Long-acting (basal) insulins provide steady background glucose control and are typically taken once or twice daily, while rapid-acting (bolus) insulins manage mealtime glucose spikes. Providers prescribe the best insulin or combination of insulins for a patient based on their lifestyle, food consumption, age, and other characteristics. In the demand model below, delivery method defines the nests and length of action defines the choice set.

Market structure. The U.S. insulin market is highly concentrated (Knox, 2020). Three firms, Eli Lilly, Novo Nordisk, and Sanofi, account for the vast majority of insulin sales, including 90% of global insulin sales (Knox, 2020). Several “follow-on” biologic insulins have entered the market since 2020, but the presence of biosimilars has been limited. The prices of insulin products rose steadily through the 2010s, with the average price paid for insulin by patients with type 1 diabetes doubling from 2012 to 2016 (Knox, 2020).

Patient costs. Despite its clinical necessity, one in four diabetic patients ration their insulin, which can lead to higher hospitalization rates and direct medical costs (Aroda et al., 2024; Knox, 2020). On average, type 1 diabetes-related medical costs total \$800 per month per individual, and around 15% of insulin-dependent individuals allocate almost half of their family income to insulin prescriptions (Giannouchos et al., 2024).

6.2 Data

We use a 1% sample of 2022 Medicare beneficiaries linked to Part D prescription drug event data, the Master Beneficiary Summary File, plan characteristics, and Part D formulary files. The formulary files report each plan’s tier placement and cost sharing for each drug. We focus on beneficiaries without the low-income subsidy or dual eligibility, whose cost sharing is set by the plan rather than subsidized to a few dollars.

6.3 Descriptive Evidence

6.3.1 Beneficiaries

Appendix Table [A11](#) shows the characteristics of Medicare beneficiaries in our sample. Around 15% of individuals had any medication fill during the time period, and around 1% had an insulin prescription fill during the time period. Since medication nonadherence is an issue for diabetics, we also create a group of “likely diabetics” based on drug fill history, as summarized in Appendix Table [A12](#).

6.3.2 Insulin Fill

Table [2](#) shows the characteristics of insulin fills. The market is dominated by branded products and concentrated: out of the 114 products, the top three products accounted for 38% of the market share. There is also variation in the prices of insulin products: while the average patient out-of-pocket price is \$31, 10% of fills required a patient out-of-pocket payment of more than \$100. Similarly, while the average list price is around \$665, around 10% of fills had a list price of more than \$1,500. Because the \$35 copay cap exceeds the mean out-of-pocket price, it binds only for the upper tail of fills.

Appendix Table [A13](#) shows what type of products insulin users filled in a given month, limiting to patients with an insulin fill at some point in the sample. Rapid- and long-acting insulin are most likely combined with other lengths of action (and recommended by doctors for patients without an insulin pump): 92.4% of patients with multiple length-of-action fills had a rapid insulin, and 95.6% had a long-acting insulin.

6.3.3 Insurance Coverage

We filter to stand-alone Part D plans (PDPs), so that we do not have to model insurers internalizing potential cost savings from fewer adverse events. Appendix Table [A14](#) shows descriptive statistics for the 776 PDPs offered across Part D regions.² There are around 20 PDPs available in each region, with an average premium of \$48 per month. Plans either have \$480 in deductible (defined standard benefit) or \$0 (enhanced alternative). The average PDP enrolls around 50

²Among non-subsidized, non-dual enrollment enrollees only.

Table 2: Insulin Fill Summary Statistics

Characteristic	Average
Share branded (vs generic)	0.95
Product market shares (top 3)	
Product A	0.19
Product B	0.11
Product C	0.08
Prices (\$)	
<i>Patient out-of-pocket</i>	30.9
Share above \$30	0.32
Share above \$50	0.21
Share above \$100	0.10
<i>List price</i>	664.5
Share above \$600	0.33
Share above \$1000	0.19
Share above \$1500	0.10

individuals in our sample and takes up 1% of the market. Among likely diabetics, the average plan enrolls around 5% of patients in the region.

Appendix Figure A9 shows the share of drugs covered in some way by PDPs. On average, a plan covers slightly more than half of all insulin drugs. Appendix Figure A10 shows the distribution of plan generosity by share of a drug’s list price that the enrollee is responsible for. On average, the patient is responsible for slightly more than half of the drug’s list price.

6.3.4 Formulary

There are 6 different formulary tiers in the dataset. Appendix Figure A11 shows that there is substantial variation in which tier drugs are placed in, even within type and length-of-action groups. Most of the drugs are placed most frequently in tier 3, while some drugs are often placed in tier 1.

Appendix Figures A12 and A13 show the distribution of list price and patient out-of-pocket price by a drug’s most often placed tier. Drugs most often placed in higher tiers typically have higher list prices and higher out-of-pocket costs. This formulary-driven variation in out-of-pocket prices for the same product is what identifies demand.

6.4 Insulin Demand

We define a market by the combination of a time period t (quarter) and a demographic group g (defined as $\{\text{female, male}\} \times \{\text{white, non-white}\}$). Within each market, patients choose to fill a prescription for product j from the set of available insulin products J_t (including basal, bolus, and premix options) or choose the outside option of no fill.

Sample. We focus on non-subsidized individuals in stand-alone Part D plans (including employer-sponsored plans) who are likely to be diabetic based on their prescription history.³ For drug products, we include products that have at least 1% market share in a length-of-action category. For each drug product, we construct an out-of-pocket cost using plans' pre-initial coverage limit standard in-network copay or coinsurance associated with that tier. If the cost sharing for in-network pharmacies is not reported, we fill in using the cost sharing for in-network preferred pharmacies, followed by in-network non-preferred pharmacies. If a drug is covered by the Senior Savings model, its out-of-pocket cost is set as \$35 per month. Beneficiaries who filled two products in the same length-of-action category in a quarter (about 10% of insulin users) are excluded.

Logit demand. Conditional on health status, the indirect utility that patient i in group g receives from choosing product j in length of action l in quarter t is given by:

$$u_{ijgt} = \alpha_g \text{OOP}_{jgt} + \xi_{jt} + \varepsilon_{ijgt}$$

where OOP_{jgt} is the out-of-pocket price faced by the patient; α_g is the price sensitivity parameter, which we allow to vary by demographic group (e.g., $\alpha_g = \alpha_0 + \alpha_1 \mathbb{I}(\text{Age} > 70) + \alpha_2 \mathbb{I}(\text{Age} > 80)$); ξ_{jt} are product-time fixed effects capturing product-specific quality (brand reputation) and time-varying trends in insulin usage; and ε_{ijgt} is an idiosyncratic error term assumed to be i.i.d. Type I Extreme Value.

We also include a nested logit specification to account for the high degree of substitutability among products with the same delivery mechanism (e.g., patients are more likely to switch between two different insulin pens than from a pen to a vial): we organize the set of products J_t into nests based on **form** (Pen vs. Vial). We assume the error term ε_{ijgt} follows a generalized extreme value (GEV) distribution, allowing for correlation in unobserved utility among products within the same nest. This structure yields the following linear estimating equation for the demand of demographic group g (Berry, 1994):

$$\ln(s_{jgt}) - \ln(s_{0gt}) = \alpha_g \text{OOP}_{jgt} + \sigma \ln(s_{j|nest,g,t}) + \xi_{jt}$$

where s_{jgt}/s_{0gt} is the ratio of the market share of product j to the share of the outside option (no fill) for demographic group g ; $s_{j|nest,g,t}$ is the *conditional market share* of product j within its nest (e.g., the share of Lantus Solostar among all Pen fills in that market); and σ is the nesting

³We limit the sample to non-subsidized enrollees (no dual enrollment, no low income subsidies), since the cost-sharing level among subsidized enrollees is extremely low (quarterly average of \$4 for insulin products, compared to \$96 for non-subsidized enrollees).

parameter, where $0 \leq \sigma < 1$ measures the correlation of utility within the nest. As $\sigma \rightarrow 1$, products within the same nest become close substitutes; if $\sigma = 0$, the model collapses to the standard logit. This specification allows us to recover the own-price elasticity for product j as

$$\eta_{jgt} = \frac{\alpha_g \text{OOP}_{jgt}}{1 - \sigma} \left[1 - \sigma s_{j|nest,g,t} - (1 - \sigma) s_{jgt} \right], \quad (22)$$

reflecting that consumers are more price-sensitive when switching between products within the same nest.

Identification. The variation in OOP_{jgt} is primarily driven by the Pharmacy Benefit Manager’s (PBM) formulary design: drugs are assigned to distinct tiers, which determine the co-payment or coinsurance rate, and because formulary placement varies across plans and years due to rebate negotiations, we observe substantial price variation for the same product across different markets, identifying α_g .

Results. Table 3 shows the results. Price coefficients are negative and precisely estimated. The nesting parameter is large (0.82), indicating strong substitution within delivery forms. The median product-level own-price elasticity is -0.16 to -0.20 in plain logit and -0.71 in nested logit.

Table 3: Drug Demand Estimates

	(1)	(2)	(3)
Price Sensitivity (α , 00s)	−0.165*** (0.006)	−0.154*** (0.009)	−0.095*** (0.006)
Age>70		−0.028** (0.010)	
Age>80		0.001 (0.012)	
Demographics			
Age>70		−0.358*** (0.045)	
Age>80		−0.069 (0.058)	
Dissimilarity Parameter			0.823***
Median own price elasticity	−0.194	−0.162	−0.705
Observations	3,788	4,137	3,788
R^2	0.29	0.34	0.44

A product’s own-price elasticity combines switching among insulin products with changes

in whether a patient fills at all, and only the latter is what a class-wide copay cap affects; with $\sigma \approx 0.8$, most of the product-level response is within-nest switching. We therefore do not calibrate aggregate utilization to -0.71 but use the quasi-experimental aggregate response in Fact 2, an arc elasticity of about 0.16 among highly exposed patients and roughly zero on average. Our baseline aggregate elasticity is 0.10 , and we report 0.05 and 0.16 as alternatives.

6.5 Calibration

We calibrate the full model at the monthly frequency with one composite insulin product. Table 4 lists parameters and targets. The user share is $\delta = 0.05$, the share of Part D enrollees with a potential insulin fill. Drug demand is logit, $D(q) = \Lambda(a(v - q))$, with a and v chosen to match the observed fill rate $D(30.90) = 0.56$ and an aggregate out-of-pocket elasticity of 0.10 . The implied value of insured access, the logit inclusive value, is $W(30.90) = \$112$ per month. In the baseline there is no cash market: our claims data do not identify purchases outside Part D, so we assume users without coverage do not buy at the list price and relax this assumption below. The two insurance parameters (λ, g) are chosen so that the equilibrium premium equals the mean PDP premium of $\$48$ and a uniform per-enrollee cost is passed through to the premium at rate 0.45 , the average of Cabral et al. (2018). The bargaining weight is $\eta = 0.5$, and marginal cost is zero. Rebates are not observed in our data, so the net price is an output of the calibration rather than a target.

Benchmarking the net price. The calibrated rebate of 94.9% is deeper than external estimates: commercial discounts on the four insulins most used in Part D reached 60.5% of gross sales in 2019 (Dickson, Gabriel, Gellad, & Hernandez, 2023), Senate Finance Committee documents show Part D rebates of 68% to 80% of list in 2018–19 (U.S. Senate Committee on Finance, 2021), and because a maximum fair price cannot exceed the prior net price, NovoLog’s 2026 price bounds its prior rebate at 76% . The baseline rebate is too deep because the one-drug model gives the insurer only the premium surplus from covering insulin; φ captures what it omits. Calibrating φ so that the rebate is 70% (a net price of $\$199.35$) requires $\varphi = \$9.24$ per beneficiary-month, about 19% of the premium. Table 7 and Appendix Table A7 carry this specification through every exercise: the incidence shares do not change, only the dollar size of what a price ceiling can transfer ($\$16.70$ rather than $\$2.85$ per beneficiary-year at 75% of the net price) and the slope κ , which rises to 1.11 . We keep $\varphi = 0$ as the baseline so that the net price is a model output rather than a target.

Table 4: Calibration

Parameter	Value	Source or target
User share δ	0.05	Share of Part D enrollees with a potential insulin fill
Copay c_0	\$30.90	Mean OOP per insulin fill
List price p_L	\$664.50	Mean list price per insulin fill
Fill probability $D(c_0)$	0.56	Share of user-months with an insulin fill
Aggregate OOP elasticity	0.10	Myerson et al. (2026) : 0 on average, 0.16 in top OOP decile
Drug demand (a, v)	(0.0074, 63.7)	Implied by the two targets above
Premium sensitivity λ	0.0502	Premium \$48 (mean PDP premium) and
Other coverage value g	\$51.7	pass-through 0.45 (Cabral et al., 2018)
Insurer bargaining weight η	0.5	Symmetric Nash; varied 0.2–0.8
Marginal cost m	0	Varied to \$5 per fill
Insurer’s disagreement loss φ	0	Varied: calibrated to a 70% rebate
Cash market	None	Varied: 2% cash purchase at list, elasticity 0.5 or 1.5
<i>Implied baseline equilibrium</i>		
Net price k^* (rebate rate)	\$33.98 (94.9%)	
Enrollment: users, non-users	99.7%, 54.6%	
Users’ share of marginal enrollees ω_D	0.06%	Proposition 5

6.6 The \$35 Copay Cap

Appendix Table A8 first traces a single composite copay from \$30.90 to zero, holding the list price fixed, to measure the responses the theory characterizes. Each dollar of copay removed lowers the bargained net price by \$0.558, against 0.560 predicted by equation (20); the premium moves by less than a cent because users are inframarginal ($\omega_D = 0.06\%$); and the insurer and the manufacturer each bear half of the cost, \$5.15 per beneficiary-year at full elimination, the $1 - \eta$ split of Lemma 1. Users’ surplus rises by \$217 per user-year and total surplus by \$0.49 per beneficiary-year, one-twentieth of the transfer. The model thus predicts that a copay cap raises rebates, as the Senior Savings evaluation found.

That exercise isolates the mechanisms but is not the policy. Medicare’s copay cap is \$35, above the mean out-of-pocket price of \$30.90, so it binds only in the upper tail of cost sharing, where Fact 2 locates its effects. To simulate it we let users differ in cost sharing. Four types correspond to the bins of out-of-pocket price per fill in Table 2: 65% of users pay \$5.59 per fill, and the rest pay \$40, \$70 and \$150 (roughly a quarter of the mean list price), with user weights chosen so that the shares of fills above \$30, \$50 and \$100 match the data and the fill-weighted mean copay is \$30.90.

All types share one logit demand curve, whose two parameters are set so that the mean

fill rate is 0.56 and the response of the most exposed type matches the top out-of-pocket decile in Myerson et al. (2026), where the copay cap lowered out-of-pocket cost from about \$91 to \$45 per supply and raised fills by 8%. The implied aggregate elasticity at the mean copay is 0.05. One net price is bargained for all types, and (λ, g) are recalibrated to the premium and pass-through targets. The baseline reproduces the single-type equilibrium closely (net price \$34.02, rebate 94.9%). Table 5 reports copay caps at \$100, \$50, \$35, \$25 and zero, and the 2026 rule that links the copay cap to a regulated price.

Table 5: Cost-Sharing Caps with Heterogeneous Copays

Policy	Users affected (%)	Mean OOP (\$)	Δ Fills (%)		Net price (\$)	User gain (\$/yr)		Non-user (\$/yr)	Δ per beneficiary-year (\$)		
			All	Affected		All	Affected		Insurer	Mfr.	Total
Baseline	0	30.90	0.0	0.0	34.02	0	0	0.00	0.00	0.00	0.00
Copay cap at \$100	12	26.61	1.0	9.7	31.70	35	288	0.00	-0.68	-0.68	0.41
Copay cap at \$50	24	19.40	2.3	11.0	27.86	89	372	0.00	-1.86	-1.86	0.72
Copay cap at \$35 (2023)	35	15.57	3.0	9.2	25.83	116	332	0.00	-2.50	-2.50	0.81
Copay cap at \$25	35	12.25	3.5	10.9	24.07	140	400	0.00	-3.06	-3.06	0.87
Copay eliminated	100	0.00	5.4	5.4	17.62	226	226	0.00	-5.19	-5.19	0.93
Ceiling alone, 22% below net	0	30.90	0.0	0.0	26.54	0	0	0.00	2.51	-2.51	0.00
Ceiling with linked copay cap (2026)	35	5.95	4.5	14.0	20.75	184	527	0.00	-4.15	-4.15	0.92

Notes: Users have copays of \$5.59, \$40, \$70 and \$150 per fill in proportions matching Table 2; one net price is bargained for all. “Affected” users are those whose copay exceeds the copay cap. Mean out-of-pocket price is per insured fill. User gains are per user-year, averaged over all users and over affected users. The ceiling in the last two rows is 22% below the bargained net price (\$26.54); the linked copay cap is the lesser of \$35 and 25% of the ceiling, \$6.63. Changes are relative to the baseline.

The \$35 copay cap binds for 35% of users, who account for 32% of fills. It lowers the mean out-of-pocket price per fill by 50%, raises fills by 3.0% overall and by 9.2% among affected users, and leaves the fills of the majority unchanged. This is the pattern of Fact 2: a small aggregate utilization response that is concentrated among the exposed. The tail response is a calibration target; the aggregate response is a prediction, consistent with the absence of an average effect in Myerson et al. (2026). Our mean out-of-pocket reduction exceeds the 21% they estimate because the non-subsidized PDP fills in our sample have a heavier upper tail than their full sample. Affected users gain \$332 per year, \$116 averaged over all users. The cost falls on the insurer and the manufacturer in equal shares, \$2.50 each per beneficiary-year, with the net price falling by \$8.19 per fill; non-users pay nothing. Relative to eliminating the copay (\$226 per user-year at a cost of \$5.19 to each firm), the copay cap delivers about half the transfer at half the cost and directs it to the users with the highest exposure; a \$100 copay cap reaches 12% of users but gives each of them \$288 per year, the targeting rule of Proposition 7(c).

The last two rows combine the two instruments as the 2026 rule does (CMS, 2025): a net price ceiling 22% below the bargained net price, the average net reduction in the first negotiation cycle, with cost sharing capped at the lesser of \$35 and 25% of the ceiling. The ceiling

alone transfers \$2.51 per beneficiary-year from the manufacturer to the insurer and nothing to users. Linking cost sharing to it lowers the copay cap to \$6.63, which binds for the same 35% of users; they gain \$527 per year, and the net price falls to \$20.75, below the ceiling, so the ceiling itself does not bind. Linking the copay to the regulated price is what moves the manufacturer's concession from the insurer to patients.

6.7 Net Price Ceilings

Table 6 reports net price ceilings, with the copay fixed at \$30.90. Panel A sets the ceiling at 90%, 75% and 50% of the bargained net price of \$33.98. As Proposition 2 predicts, each ceiling is a transfer from the manufacturer to the insurer: at 75% the manufacturer loses \$2.85 per beneficiary-year and the insurer gains \$2.85, while consumers gain \$0.01 and total surplus changes by \$0.01. The insurer keeps the saving for the same reason it absorbs a copay cut: under community rating, a cost change concentrated on inframarginal users barely moves the premium. The transfer scales one for one with the depth of the ceiling.

Table 6: Counterfactual Net Price Ceilings and List-Price Cuts

	Net			Fills	Δ Consumer surplus			Δ per beneficiary-year		
Policy price	price	Rebate	Premium	per user	User	Non-user	All	Insurer	Mfr.	Total
	(\$)	(%)	(\$/mo)	(/mo)	(\$/yr)	(\$/yr)	(\$/yr)	(\$)	(\$)	(\$)
<i>A. Net price ceiling (90%, 75%, 50% of the bargained net price)</i>										
\$30.58	30.58	95.4	48.00	0.558	0.0	0.00	0.00	1.14	-1.14	0.00
\$25.48	25.48	96.2	48.00	0.558	0.0	0.01	0.01	2.85	-2.85	0.01
\$16.99	16.99	97.4	48.00	0.558	0.0	0.02	0.02	5.69	-5.69	0.02
<i>B. List-price cut, no cash market</i>										
\$500.00	33.98	93.2	48.00	0.558	0.0	0.00	0.00	0.00	0.00	0.00
\$200.00	33.98	83.0	48.00	0.558	0.0	0.00	0.00	0.00	0.00	0.00
\$100.00	33.98	66.0	48.00	0.558	0.0	0.00	0.00	0.00	0.00	0.00
\$25.48	25.48	0.0	48.00	0.558	0.0	0.01	0.01	2.85	-2.85	0.01
<i>C. List-price cut, cash market (2% purchase at list, elasticity 0.5)</i>										
\$500.00	43.88	91.2	47.99	0.553	0.7	0.09	0.12	0.55	-0.63	0.03
\$200.00	38.67	80.7	47.95	0.549	2.7	0.35	0.47	2.11	-2.46	0.12
\$100.00	36.26	63.7	47.93	0.548	3.7	0.49	0.65	2.82	-3.32	0.15

Notes: Copay fixed at \$30.90; baseline list price \$664.50 and bargained net price \$33.98. Panel A caps the price the insurer pays; the first column is the ceiling in panel A and the new list price in panels B and C. Panels B and C cut the list price, as insulin manufacturers did in 2023–24; the last row of panel B cuts it to 75% of the bargained net price, where it coincides with the second row of panel A. Panel C adds a cash market in which 2% of users buy at the baseline list price with elasticity 0.5, recalibrated to the same premium and pass-through targets; changes are measured against each panel's own baseline.

Panels B and C turn to the list price (Appendix Figure A8 traces the bargained net price against the list price and against a net price ceiling, with and without a cash market). In panel B, the baseline specification without a cash market, list-price cuts to \$500, \$200 and

\$100 change nothing: the rebate rate falls from 94.9% to accommodate the lower list price, and the net price, premium, enrollment and all surpluses are unchanged. These zeros are the content of Proposition 3. A cut to 75% of the bargained net price reproduces the second row of panel A exactly, which is part (iii) of that proposition. In panel C, 2% of users would buy at the list price if the drug were not covered. The list price now moves the manufacturer's outside option, and a cut to \$200 lowers the bargained net price from \$45.69 to \$38.67, costs the manufacturer \$2.46 per beneficiary-year, and raises users' surplus by \$2.67 per user-year, mostly by lowering the price paid by cash buyers.

6.8 Incidence and Market Structure

Appendix B.4 decomposes each policy into the direct, premium, and bargaining channels of equation (8). Table 7 shows how the incidence of the two instruments varies with market structure, re-calibrating the insurance parameters in each row to the same premium and the stated pass-through. For the copay cut it reports the shares of the cost borne by the insurer, the manufacturer, and non-users; for a ceiling at 75% of the bargained net price, the gains of the insurer and of consumers per dollar of manufacturer loss.

Table 7: Incidence by Market Structure

Market structure	Copay from \$30.90 to \$0					Net price ceiling	
	ω_D (%)	User gain (\$/yr)	Share of cost borne by (%)			Gain per \$1 of mfr. loss (%)	
			Insurer	Mfr.	Non-users	Insurer	Consumers
Baseline	0.06	217	50	50	1	100	0
Weak insurer bargaining, $\eta = 0.2$	0.06	217	20	80	1	100	0
Strong insurer bargaining, $\eta = 0.8$	0.06	217	79	20	1	100	0
Low pass-through, 0.13	0.00	218	50	50	0	100	0
High pass-through, 0.74	1.18	206	45	45	11	100	6
Users more marginal	3.37	179	28	28	44	100	21
Larger gains from agreement	0.06	218	50	50	0	100	0

Notes: Each row re-calibrates (λ, g) to a \$48 premium and the stated pass-through (0.45 unless noted). Cost of the copay cut is the sum of insurer and manufacturer losses and non-users' premium losses, per beneficiary-year. The ceiling is set at 75% of each specification's bargained net price. "Users more marginal" sets the value of insulin coverage to \$25 per month, so that more users are near the enrollment margin. "Larger gains from agreement" sets the insurer's disagreement loss φ so that the baseline rebate is 70% (net price \$199.35). Appendix Table A7 reports further specifications.

Three patterns stand out. First, bargaining power divides the cost of a copay cut between the firms. The manufacturer bears 20% when the insurer is strong ($\eta = 0.8$) and 80% when it is weak ($\eta = 0.2$), as equation (20) predicts. Second, non-users pay only when users are marginal enrollees. Their share is about 1% at the baseline, 11% with high premium pass-through, and 44% when users value coverage less and so are more often marginal. Third, a net price ceiling

is a transfer to the insurer: consumers receive 0.3 cents per dollar of manufacturer loss at the baseline, 6.0 cents with high pass-through, and 21.1 cents when users are more marginal. The last row raises the insurer’s gains from agreement until the rebate matches external evidence; the shares in every column are unchanged, and only the dollar amounts behind them scale with the net price.

Appendix Table A7 repeats the exercise for alternative elasticities, user shares, marginal cost, and cash markets; total surplus falls only where users are most marginal or pass-through is highest, the premium-distortion case of Proposition 6.

6.9 Competing Plans: A Plan-Level Copay Cap versus a Market-Wide Mandate

The single-insurer model predicts that non-users bear almost none of a copay cut, because insulin users are inframarginal to coverage, yet non-users in Senior Savings PDPs paid \$30–\$65 per year (Fact 3). The difference is that the Senior Savings copay cap was adopted plan by plan. To make that argument quantitative we extend the application to n symmetric plans that compete in premiums. Users and non-users choose among the n plans and no coverage with logit preferences; one bargaining unit, a pharmacy benefit manager serving all plans, negotiates a single net price, and disagreement means no plan covers the drug. Each plan sets its premium as a best response to the others’. We hold the drug side at its baseline and recalibrate (λ, g) to the \$48 premium and the baseline non-user enrollment rate of 54.6%; a cost common to all plans then passes through at a rate close to one (1.00 at $n = 20$), a property of logit competition among small plans rather than a calibration choice.

Competition changes which enrollees are marginal: with one insurer the only margin is coverage itself, to which users are inframarginal ($\omega_D = 0.06\%$), whereas with $n = 20$ plans each plan’s marginal enrollee is mostly a switcher from another plan, and users’ share of a plan’s marginal enrollees is 8.1% even though 93% of them hold coverage. Table 8 compares a market-wide mandate that sets the copay to zero in every plan, as the Inflation Reduction Act did with the \$35 copay cap, with a plan-level copay cap adopted by one plan while the others keep the \$30.90 copay, as in the Senior Savings Model, for $n = 5$ and $n = 20$ and next to the single-insurer results.

Three results follow. First, under the market-wide mandate the net price falls by \$17.93 per fill, as with one insurer, but the premium rises by \$0.79 per month rather than \$0.01, because each plan prices against its plan-level margin, at which users are marginal. Non-users lose \$5.2 per year, and total surplus falls by \$1.20 per beneficiary-year where it rose by \$0.49 with one insurer: with near-complete pass-through, the premium distortion in Proposition 6 outweighs the gain from induced fills.

Table 8: Eliminating the Copay with Competing Plans: Market-Wide Mandate versus Plan-Level Copay Cap

Change relative to baseline	Single	5 plans		20 plans	
	insurer	Market-wide	One plan	Market-wide	One plan
<i>A. Prices</i>					
Premium of capping plan(s) (\$/month)	0.01	0.71	2.13	0.79	2.65
Premium of other plans (\$/month)	–	–	-0.30	–	-0.08
Net price (\$/fill)	-17.07	-17.89	-5.23	-17.93	-1.34
<i>B. Selection into the capping plan</i>					
Users' share of marginal enrollees, before (%)	0.06	7.66	7.66	8.10	8.10
Users' share of marginal enrollees, after (%)	0.03	7.81	9.67	8.31	11.19
User enrollment (%)	0.2	1.9	34.2	2.2	37.7
Non-user enrollment (%)	0.0	-0.8	-4.8	-0.8	-5.6
<i>C. Incidence</i>					
Users' gain (\$/user-year)	217	200	192	197	186
Non-users' loss (\$/non-user-year)	0.1	4.6	25.6	5.2	31.7
Ratio of non-user loss to user gain	0.00	0.02	0.13	0.03	0.17
Insurers (\$/beneficiary-year)	-5.15	-2.38	-0.61	-1.88	-0.13
Manufacturer (\$/beneficiary-year)	-5.15	-4.45	-1.21	-4.23	-0.29
Total surplus (\$/beneficiary-year)	0.49	-1.23	-0.63	-1.20	-0.18

Notes: Copay reduced from \$30.90 to \$0 in every plan (“market-wide”) or in one plan only (“one plan”). The single-insurer column repeats Appendix Table A8. Plans are symmetric; (λ, g) are re-calibrated for each n to a \$48 premium and 54.6% non-user enrollment; one net price is negotiated for all plans. Panel B reports users' share of the capping plan's marginal enrollees before and after the policy and the change in the plan's enrollment by group. In the one-plan columns, users' gain and non-users' loss are for enrollees who remain in the capping plan, and the insurer row sums over all plans. In the market-wide and single-insurer columns they are the average over all users and non-users, including those who change coverage.

Second, a plan-level copay cap is paid by the capping plan's own pool. The plan's user enrollment rises by 38% and its non-user enrollment falls by 5.6%, its premium rises by \$2.65 per month, and non-users who remain lose \$32 per year against a gain of \$186 for users who remain, a ratio of 0.17 (0.13 with five plans). In CMS's evaluation, non-users in participating PDPs lost \$30–\$65 per year, 0.08–0.20 of users' gain, and insulin-user enrollment rose by 75%–92%. The model was not fit to these moments, and the correspondence is an order-of-magnitude check rather than a test, but it reproduces what the single-insurer model could not.

Third, the bargaining channel is a feature of market-wide policy: under the plan-level copay cap the net price falls by only \$1.34 per fill, because the capping plan is a small share of insured fills and the net price is common to all plans. The two policies regulate the same price for the same drug; what differs is the margin against which premiums are set. The extension abstracts from plan asymmetries, risk adjustment, reinsurance and premium subsidies, and PBMs serving subsets of plans.

6.10 Which Drugs Should a Regulator Target?

To illustrate the targeting rules, we hold the insurance market (premium sensitivity, other coverage value, bargaining weight) at the baseline and vary one characteristic of the drug at a time. The value of coverage to users is held at \$112 per month throughout, so that the archetypes differ only in the stated respect. We apply two policies to each drug: a \$10 copay cap and a net price ceiling at 40% of the list price, roughly the average negotiated discount in Table 1. Table 9 reports the results.

Table 9: Regulating Archetypal Drugs in a Common Insurance Market

Drug	Baseline			\$10 copay cap		Ceiling at 40% of list		
	Gross spending	Net spending	Rebate (%)	Δ Cons. surplus	Δ Net spending	Δ Cons. surplus	Δ Net spending	Δ TS (copay cap)
A. Baseline insulin	222.6	11.4	95	7.18	-3.37	0.00	0.00	0.44
B. High exposure (\$60 copay)	222.6	16.3	93	17.35	-8.20	0.00	0.00	0.95
C. Low exposure (\$12 copay)	222.6	8.2	96	0.67	-0.30	0.00	0.00	0.06
D. Elastic use (0.30)	222.6	11.4	95	7.63	-3.15	0.00	0.00	1.33
E. Shallow rebate (\$70 list)	23.4	11.4	51	7.18	-3.37	0.01	-2.00	0.44
F. Many users (10%)	445.0	23.4	95	14.31	-6.72	0.00	0.00	0.87
G. Many users, shallow rebate	46.9	23.4	50	14.31	-6.72	0.02	-4.63	0.87

Notes: Dollars per beneficiary-year. Gross spending values insured fills at the list price; net spending is payments to the manufacturer. Each drug differs from the baseline insulin (copay \$30.90, aggregate elasticity 0.10, list price \$664.50, user share 0.05) only as stated. Premiums and rebates are re-solved in every case.

The consumer-welfare ranking follows equation (21): the copay cap raises consumer surplus most for the high-exposure drug (\$17.35 per beneficiary-year) and the drug with many

users (\$14.31), and hardly at all for the low-exposure drug (\$0.67); the price ceiling does almost nothing for consumers in any case. The spending ranking differs. The 40%-of-list ceiling binds only for the two shallow-rebate drugs, saving \$2.00 and \$4.63 per beneficiary-year, and saves nothing for the drug with the highest gross spending (F), whose 95% rebate already places its net price below the ceiling; ranking by gross spending would select F first and G last. Consistent with Proposition 7(b), the copay cap also lowers net spending, by \$3.37 for the baseline drug and \$8.20 for the high-exposure drug, less for the elastic drug (\$3.15), where induced fills offset the lower net price.

6.11 Model Predictions and the Evidence

The model's predictions line up with the evidence from implemented policies. The \$35 copay cap raises fills by 3.0% overall, consistent with the absence of an average effect under the national copay cap, while the 9.2% response of affected users matches the 8%–9% increases in the top out-of-pocket decile and in Senior Savings plans. Manufacturers finance part of a copay cut through larger rebates, as the Senior Savings evaluation found. The single-insurer model cannot reach that evaluation's non-user losses of 0.08–0.20 of users' gain even when only 61% of users enroll, but the competing-plans extension does (0.17), because participation was plan-level; the same extension predicts that the 2023 market-wide copay cap cost non-users \$5 per year, a test that requires separating the cap from the concurrent Part D redesign. The first negotiation cycle realized 17% of its headline reduction, and the 70%–78% list-price cuts that insulin manufacturers made in 2023–24, after the removal of the Medicaid rebate cap made high list prices costly (ASPE, 2026; KFF, 2024), offer a further test of Proposition 3 once post-2022 data are available: little change in net prices or fixed-copay patients' prices, with gains concentrated among cash and coinsurance patients.

7 Conclusion

Who wins and who loses from drug price regulation depends on which link in the pricing chain the regulation targets and on the structure of the market. A net price ceiling transfers surplus from the manufacturer to the insurer; consumers share in it only to the extent that drug users are marginal to the plan, and in our calibration they receive less than a cent per dollar. A copay cap benefits drug users directly and concentrates the benefit on the most exposed: Medicare's \$35 copay cap binds for a third of insulin users and raises their fills while leaving aggregate use nearly unchanged. Its cost is divided between insurer and manufacturer according to bargaining power, and it reaches non-users only when users are marginal enrollees, which depends on the policy's scope: a copay cap adopted by one of several competing plans is paid by that plan's non-users through selection, as in Medicare's voluntary insulin

copay-cap model, while a market-wide mandate is paid by the firms. The list price enters these conclusions only through what patients would pay outside coverage, which is why list-price discounts overstate savings and why the maximum fair price, benchmarked to the prior net price, binds by construction.

These results determine the regulator's choices. A regulator that maximizes consumer welfare should cap copays and target drugs with high out-of-pocket prices, many users, and elastic utilization. A regulator that minimizes spending should target drugs with high spending *and* shallow rebates; gross spending, the basis of Medicare's selection rule, is informative only after netting out rebates, as the first negotiation cycle, in which list discounts implied nearly six times the net savings CMS projects, illustrates.

Several limitations affect the magnitudes. The model has one drug and one manufacturer; competition among therapeutic substitutes shapes the disagreement point (Ho & Lee, 2026) and is where rebates could survive below a binding ceiling. The competing-plans extension has symmetric plans and a single bargaining unit. We abstract from federal reinsurance and subsidies, the phases of the Part D benefit, health effects of adherence, and dynamic effects on innovation (Agha, Kim, & Li, 2022; Garber, Jones, & Romer, 2006). Premium sensitivity is disciplined by external pass-through estimates rather than estimated plan choice, rebates are unobserved so the net price is a model output, and cash purchases outside Part D are unobserved and, by Proposition 4, govern how far neutrality extends. The mechanisms, and the targeting rules they imply, are supported by the administrative evidence from Medicare's insulin copay cap and its first negotiated prices.

References

- ADA. (2026). *State insulin copay caps*. Retrieved from <https://diabetes.org/tools-resources/affordable-insulin/state-insulin-copay-caps>
- Agha, L., Kim, S., & Li, D. (2022). Insurance design and pharmaceutical innovation. *American Economic Review: Insights*, 4(2), 191–208.
- Aroda, V. R., Nielsen, N., Mangla, K. K., Multani, J., Divino, V., Namvar, T., & Rajpura, J. (2024, March). Greater persistence and adherence to basal insulin therapy is associated with lower healthcare utilization and medical costs in patients with type 2 diabetes: a retrospective database analysis. *BMJ Open Diabetes Research & Care*, 12(2), e003825. Retrieved 2026-03-28, from <https://drc.bmj.com/lookup/doi/10.1136/bmjdr-2023-003825> doi: 10.1136/bmjdr-2023-003825
- ASPE. (2026). *The changing insulin affordability landscape: Lower out-of-pocket costs and expanded access pathways*. Office of the Assistant Secretary for Planning and Evaluation. Retrieved from <https://aspe.hhs.gov/reports/insulin-affordability>

-landscape

- Bailey, J., & Blascak, N. (2016). The Effect of State Health Insurance Benefit Mandates on Premiums and Employee Contributions. *Applied Economics Letters*, 23(14), 1042–1046.
- Berry, S. T. (1994). Estimating discrete-choice models of product differentiation. *RAND Journal of Economics*, 25(2), 242–262.
- Brot-Goldberg, Z. C., Chandra, A., Handel, B. R., & Kolstad, J. T. (2017). What does a deductible do? The impact of cost-sharing on health care prices, quantities, and spending dynamics. *Quarterly Journal of Economics*, 132(3), 1261–1318.
- Cabral, M., Geroso, M., & Mahoney, N. (2018). Do larger health insurance subsidies benefit patients or producers? Evidence from Medicare Advantage. *American Economic Review*, 108(8), 2048–2087.
- Chandra, A., Gruber, J., & McKnight, R. (2010). Patient cost-sharing and hospitalization offsets in the elderly. *American Economic Review*, 100(1), 193–213.
- CMS. (2023a). *Anniversary of the Inflation Reduction Act: Update on CMS implementation*. Retrieved from <https://www.cms.gov/newsroom/fact-sheets/anniversary-inflation-reduction-act-update-cms-implementation>
- CMS. (2023b). *National health expenditures 2022 highlights*. Retrieved from <https://www.cms.gov/newsroom/fact-sheets/national-health-expenditures-2022-highlights>
- CMS. (2024). *Medicare Drug Price Negotiation Program: Negotiated prices for initial price applicability year 2026*. Retrieved from <https://www.cms.gov/newsroom/fact-sheets/medicare-drug-price-negotiation-program-negotiated-prices-initial-price-applicability-year-2026>
- CMS. (2025). *Contract year 2026 policy and technical changes to the Medicare Advantage program, Medicare prescription drug benefit program, Medicare cost plan program, and programs of all-inclusive care for the elderly (CMS-4208-F)*. Final rule fact sheet. Retrieved from <https://www.cms.gov/newsroom/fact-sheets/contract-year-2026-policy-and-technical-changes-medicare-advantage-program-medicare-prescription-final>
- CMS. (2025). *Part D senior savings model final evaluation, 2021 to 2023*. Evaluation report. Retrieved from <https://www.cms.gov/priorities/innovation/data-and-reports/2025/pdss-final-eval-rpt>
- CMS. (2026). *CMS announces participants in landmark Medicaid drug payment model to bring down drug costs for most vulnerable americans*. Retrieved from <https://www.cms.gov/newsroom/press-releases/cms-announces-participants-landmark-medicare-drug-payment-model-bring-down-drug-costs-most>
- Collard-Wexler, A., Gowrisankaran, G., & Lee, R. S. (2019). “Nash-in-Nash” bargaining: A

- microfoundation for applied work. *Journal of Political Economy*, 127(1), 163–195.
- Cubanski, J. (2026). *President Trump proposes codifying MFN drug pricing deals but key details are missing*. KFF quick take. Retrieved from <https://www.kff.org/quick-take/president-trump-proposes-codifying-mfn-drug-pricing-deals-but-key-details-are-missing/>
- Cubanski, J., & Damico, A. (2022). *Insulin Out-of-Pocket Costs in Medicare Part D*. Retrieved from <https://www.kff.org/medicare/insulin-out-of-pocket-costs-in-medicare-part-d/>
- Cubanski, J., & Neuman, T. (2024). *The Facts About the \$35 Insulin Copay Cap in Medicare*. Retrieved from <https://www.kff.org/medicare/the-facts-about-the-35-insulin-copay-cap-in-medicare/>
- Cubanski, J., & Neuman, T. (2026). *Key Facts About Medicare Drug Price Negotiation*. Retrieved from <https://www.kff.org/medicare/key-facts-about-medicare-drug-price-negotiation/?entry=table-of-contents-in-2026-cms-selected-15-medicare-part-b-and-d-drugs-for-price-negotiation-with-negotiated-prices-taking-effect-in-2028>
- Dafny, L., Duggan, M., & Ramanarayanan, S. (2012). Paying a premium on your premium? Consolidation in the US health insurance industry. *American Economic Review*, 102(2), 1161–1185.
- Dafny, L., Ody, C., & Schmitt, M. (2017). When discounts raise costs: The effect of copay coupons on generic utilization. *American Economic Journal: Economic Policy*, 9(2), 91–123.
- Decarolis, F., Polyakova, M., & Ryan, S. P. (2020). Subsidy design in privately provided social insurance: Lessons from Medicare Part D. *Journal of Political Economy*, 128(5), 1712–1752.
- Demirer, M., & Rubens, M. (2025). *Welfare effects of buyer and seller power* (Working Paper). Cambridge, MA: National Bureau of Economic Research.
- Dickson, S. R., Gabriel, N., Gellad, W. F., & Hernandez, I. (2023). Assessment of commercial and mandatory discounts in the gross-to-net bubble for the top insulin products from 2012 to 2019. *JAMA Network Open*, 6(6), e2318145.
- Duggan, M., & Scott Morton, F. (2010). The effect of Medicare Part D on pharmaceutical prices and utilization. *American Economic Review*, 100(1), 590–607.
- Einav, L., Finkelstein, A., & Polyakova, M. (2018). Private provision of social insurance: Drug-specific price elasticities and cost sharing in Medicare Part D. *American Economic Journal: Economic Policy*, 10(3), 122–153.
- Garber, A. M., Jones, C. I., & Romer, P. (2006). Insurance and incentives for medical innova-

- tion. *Forum for Health Economics & Policy*, 9(2).
- Giannouchos, T. V., Ukert, B., & Buchmueller, T. (2024). Health outcome changes in individuals with type 1 diabetes after a state-level insulin copayment cap. *JAMA Network Open*, 7(8), e2425280.
- Gowrisankaran, G., Nevo, A., & Town, R. (2015). Mergers when prices are negotiated: Evidence from the hospital industry. *American Economic Review*, 105(1), 172–203.
- Ho, K., & Lee, R. S. (2017). Insurer competition in health care markets. *Econometrica*, 85(2), 379–417.
- Ho, K., & Lee, R. S. (2026). Fisher–Schultz lecture: Contracting over pharmaceutical formularies and rebates. *Econometrica*, 94(3), 689–728. doi: [10.3982/ECTA22488](https://doi.org/10.3982/ECTA22488)
- Horn, H., & Wolinsky, A. (1988). Bilateral monopolies and incentives for merger. *RAND Journal of Economics*, 19(3), 408–419.
- Hsu, J., Price, M., Huang, J., Brand, R., Fung, V., Hui, R., ... Selby, J. V. (2006). Unintended consequences of caps on Medicare drug benefits. *New England Journal of Medicine*, 354(22), 2349–2359.
- KFF. (2024). *What are the implications of the recent elimination of the Medicaid prescription drug rebate cap?* Kaiser Family Foundation. Retrieved from <https://www.kff.org/medicaid/what-are-the-implications-of-the-recent-elimination-of-the-medicaid-prescription-drug-rebate-cap/>
- Knox, R. (2020). Insulin insulated: Barriers to competition and affordability in the United States insulin market. *Journal of Law and the Biosciences*, 7(1), Isaa061.
- Milliman. (2024). *Medicare price negotiation: A paradigm shift in Part D access and cost*. Milliman white paper. Retrieved from <https://www.milliman.com/en/insight/medicare-price-negotiation-paradigm-shift-part-d-access-cost>
- Myerson, R., Kim, N. H., Romley, J., Qato, D. M., Cao, Y., Trish, E., ... Goldman, D. (2026). Insulin costs and use by Medicare beneficiaries after the Inflation Reduction Act out-of-pocket cap. *JAMA*, 336(1), 25–34.
- U.S. Senate Committee on Finance. (2021). *Insulin: Examining the factors driving the rising cost of a century old drug*. Staff report. Retrieved from <https://www.finance.senate.gov/imo/media/doc/Insulin%20Committee%20Print.pdf>
- Weyl, E. G., & Fabinger, M. (2013). Pass-through as an economic tool: Principles of incidence under imperfect competition. *Journal of Political Economy*, 121(3), 528–583.
- White House. (2025). *Delivering most-favored-nation prescription drug pricing to American patients*. Executive order. Retrieved from <https://www.whitehouse.gov/presidential-actions/2025/05/delivering-most-favored-nation-prescription-drug-pricing-to-american-patients/>

A Proofs

Proof of Proposition 1. We derive the entries of Proposition 1 channel by channel. In this derivation we write $s(\cdot)$ for the demand function $D(\cdot)$ and $r = p - k$ for the rebate, and we label each term by the channel it operates through: the payment from the insurer to the manufacturer, the premium, the rebate, and consumers' out-of-pocket payments. Case 1 is the protocol in which the manufacturer makes the offer and Case 2 the protocol in which the insurer makes the offer; in Case 1 the rebate satisfies $S(k) = 0$, and in Case 2 it holds the manufacturer to $pD(p)$.

Social welfare is $W(c) + cs(c)$. In other words, it is total consumer value from the drug net of out-of-pocket payments. However, we are interested in not just social welfare, but also how it is distributed among the manufacturer, the insurer, and consumers.

There are externalities not captured in this stylized model: manufacturer welfare may have positive externalities due to innovation incentives, insurer welfare may have positive externalities because it can be passed on to enrolled consumers in other drug markets, and consumer welfare may have positive externalities because it is tied to public health.

List price. Suppose a policy regulates the list price p .

In Case 1 (where the manufacturer has all bargaining power),

$$\frac{\partial}{\partial p} \text{Manufacturer Welfare} = \underbrace{s(c)}_{\text{Payment}} + \underbrace{[-W'(p) - s(c)]}_{\text{Rebate}} = -W'(p) \quad (23)$$

$$\frac{\partial}{\partial p} \text{Insurer Welfare} = \underbrace{(-W'(p))}_{\text{Premium}} + \underbrace{(-s(c))}_{\text{Payment}} + \underbrace{[W'(p) + s(c)]}_{\text{Rebate}} = 0 \quad (24)$$

$$\frac{\partial}{\partial p} \text{Consumer Welfare} = \underbrace{W'(p)}_{\text{Premium}} \quad (25)$$

If the list price increases, the direct effect is that the insurer pays more per unit to the manufacturer. Some of that cost is passed on to consumers through higher premiums. The rebate adjusts so the insurer is as well off as before. The manufacturer is better off and consumers are worse off, but social welfare is unchanged.

In Case 2 (where the insurer has all bargaining power),

$$\frac{\partial}{\partial p} \text{Manufacturer Welfare} = \underbrace{s(c)}_{\text{Payment}} + \underbrace{[-s(c) + s(p) + ps'(p)]}_{\text{Rebate}} = s(p) + ps'(p) \quad (26)$$

$$\frac{\partial}{\partial p} \text{Insurer Welfare} = \underbrace{[-\alpha W'(p) + (1 - \alpha)(s(p) + ps'(p))]}_{\text{Premium}} + \quad (27)$$

$$\underbrace{(-s(c))}_{\text{Payment}} + \underbrace{[s(c) - s(p) - ps'(p)]}_{\text{Rebate}} \quad (28)$$

$$= -\alpha W'(p) - \alpha [s(p) + ps'(p)] \quad (29)$$

$$\frac{\partial}{\partial p} \text{Consumer Welfare} = \underbrace{\alpha W'(p) - (1 - \alpha)[s(p) + ps'(p)]}_{\text{Premium}} \quad (30)$$

If the list price increases, the direct effect is that the insurer pays more per unit to the manufacturer. The premium and rebate adjust. Welfare is redistributed among the manufacturer, the insurer, and consumers, but social welfare is unchanged.

Copay. Suppose a policy regulates the copay c .

In Case 1,

$$\frac{\partial}{\partial c} \text{Manufacturer Welfare} = \underbrace{ps'(c)}_{\text{Payment}} + \underbrace{[W'(c) - ps'(c) + s(c) + cs'(c)]}_{\text{Rebate}} \quad (31)$$

$$= W'(c) + s(c) + cs'(c) \quad (32)$$

$$\frac{\partial}{\partial c} \text{Insurer Welfare} = \underbrace{W'(c)}_{\text{Premium}} + \underbrace{(-ps'(c))}_{\text{Payment}} + \underbrace{[s(c) + cs'(c)]}_{\text{OOP}} + \quad (33)$$

$$\underbrace{[-W'(c) + ps'(c) - s(c) - cs'(c)]}_{\text{Rebate}} \quad (34)$$

$$= 0 \quad (35)$$

$$\frac{\partial}{\partial c} \text{Consumer Welfare} = \underbrace{W'(c)}_{\text{Value}} + \underbrace{(-W'(c))}_{\text{Premium}} = 0 \quad (36)$$

If the copay increases, the direct effects are that consumers lose value from the drug, out-of-pocket payments from consumers to the insurer are shifted, and the insurer buys fewer units from the manufacturer. The premium is reduced so consumers are as well off as before. The rebate adjusts so the insurer is as well off as before. All of the social welfare change is borne by the manufacturer.

In Case 2,

$$\frac{\partial}{\partial c} \text{Manufacturer Welfare} = \underbrace{ps'(c)}_{\text{Payment}} + \underbrace{(-ps'(c))}_{\text{Rebate}} = 0 \quad (37)$$

$$\frac{\partial}{\partial c} \text{Insurer Welfare} = \underbrace{[\alpha W'(c) - (1 - \alpha)(s(c) + cs'(c))]}_{\text{Premium}} + \quad (38)$$

$$\underbrace{(-ps'(c))}_{\text{Payment}} + \underbrace{[s(c) + cs'(c)]}_{\text{OOP}} + \underbrace{ps'(c)}_{\text{Rebate}} \quad (39)$$

$$= \alpha [W'(c) + s(c) + cs'(c)] \quad (40)$$

$$\frac{\partial}{\partial c} \text{Consumer Welfare} = \underbrace{W'(c)}_{\text{Value}} + \underbrace{[-\alpha W'(c) + (1 - \alpha)(s(c) + cs'(c))]}_{\text{Premium}} \quad (41)$$

$$= (1 - \alpha) [W'(c) + s(c) + cs'(c)] \quad (42)$$

If the copay increases, the direct effects are that consumers lose value from the drug, out-of-pocket payments from consumers to the insurer are shifted, and the insurer buys fewer units from the manufacturer. The premium adjusts to redistribute welfare between the insurer and consumers. The rebate increases so the manufacturer is as well off as before. All of the social welfare change is distributed between the insurer and consumers.

Proof of Lemma 1. Write $G_M = \Pi_M - \Pi_M^0 = \delta s_D[(k - m)D(c) - (p_L - m)D_0]$ and $G_I = \Pi_I - \Pi_I^0 + \varphi$. By the envelope theorem applied to the insurer's premium choice, $dG_I/dk = -\delta s_D D(c) = -Q$. With $\partial P^*/\partial k = 0$, s_D does not vary with k , so $dG_M/dk = Q$. The first-order condition $(1 - \eta)Q/G_M = \eta Q/G_I$ gives $G_I = \frac{\eta}{1 - \eta} G_M$, hence $G_M = (1 - \eta)J$ where $J = G_M + G_I$. Substituting for G_M and solving for k gives (12). Single-peakedness implies that if $k^u > \bar{k}$ the constrained optimum is the boundary $k = \bar{k}$. If $\partial P^*/\partial k \neq 0$, then $dG_M/dk = Q(1 + \varphi)$ with $\varphi = \delta s'_D (\partial P^*/\partial k)[(k - m)D(c) - (p_L - m)D_0]/Q$, and the same steps give $G_M = J(1 - \eta)(1 + \varphi)/[(1 - \eta)(1 + \varphi) + \eta]$. By Proposition 5, $\partial P^*/\partial k = \rho \omega_D D(c)$ and $s'_D = -\lambda s_D(1 - s_D)$, so $\varphi \rightarrow 0$ as $\omega_D \rightarrow 0$.

Proof of Proposition 2. (i) The Nash objective is single-peaked with unconstrained maximizer k^u , so its maximizer on $[0, \bar{k}]$ is $\min\{k^u, \bar{k}\}$. If $\bar{k} < k^u$ the objective is increasing on $[0, \bar{k}]$, so no $k < \bar{k}$ is agreed. (ii) When the ceiling binds, $k = \bar{k}$ and the insurer chooses $P^*(\bar{k})$. By the envelope theorem, $d\Pi_I/d\bar{k} = \partial\Pi_I/\partial k = -Q$. The insurer's cost per user is $u_D = (\bar{k} - c)D(c)$, so by Proposition 5 $dP^*/d\bar{k} = \rho \omega_D D(c)$. Consumer surplus depends on $\bar{k}$ only through P , with $\partial CS_D/\partial P = -s_D$ and $\partial CS_N/\partial P = -s_N$, so $dCS_A/d\bar{k} = -S\rho \omega_D D(c)$. Manufacturer profit is $\delta s_D(\bar{k} - m)D(c)$, so $d\Pi_M/d\bar{k} = Q + \delta(\bar{k} - m)D(c)s'_D dP^*/d\bar{k}$, and the second term is of order

ω_D since $s'_D = -\lambda s_D(1 - s_D)$. (iii) With $\omega_D = 0$, P^* does not vary with $\bar{k}$, so neither does any consumer surplus term or enrollment; $\Delta\Pi_I = -\Delta\Pi_M = Q$ per dollar and total surplus is unchanged.

Proof of Proposition 3. With $D_0 \equiv 0$, $W_0 \equiv 0$ and a fixed copay, p_L does not appear in s_D , s_N , Π_I , Π_M , $\Pi_M^0 = 0$, or Π_I^0 , all of which depend on (k, c, P) . The insurer's premium problem given k is therefore independent of p_L , and so is the Nash objective as a function of k . Its unconstrained maximizer $k^u(c)$ is independent of p_L , proving (i). For $p_L \geq k^u$, $k^* = \min\{k^u, p_L\} = k^u$, and every outcome is a function of $(k^*, c, P^*(k^*))$ only, proving (ii); the rebate rate is $1 - k^u/p_L$ by definition. For (iii), a list price $\bar{p}$ restricts $k \leq \bar{p}$ and, absent any payoff that depends on p_L , has no other effect; a net price ceiling $\bar{k}$ restricts $k \leq \bar{k}$. Both yield $k^* = \min\{k^u, \text{ceiling}\}$ by Proposition 2(i).

Proof of Proposition 4. The derivation uses the notation of Appendix B.3: s_{md} and s_{0d} are insured and cash demand, $D(c)$ and $D_0(p_L)$ in the text; r is the rebate, so the net price is $k = p_L(1 - r)$; α is the user share δ ; and π_{mfg} is manufacturer profit with $m = 0$. The expression $r^* = 1 - s_{0d}/s_{md}$ is $k^* = p_L D_0(p_L)/D(c)$, and the derivatives below are those stated in the proposition. Assume the insurer has all bargaining power ($\eta = 1$) to derive closed form solutions. The manufacturer is held to their outside option, $GFT_d = 0$.

This implies that the optimal rebate rate is

$$r^* = 1 - \frac{s_{0d}}{s_{md}}$$

which depends on the ratio of purchase probability for enrolled and non-enrolled diabetics.

The change in negotiated rebate given a change in the list price and copay are given by

$$\frac{dr^*}{dp_L} = -\frac{1}{s_{md}} \frac{\partial s_{0d}}{\partial p_L} > 0, \quad \frac{dr^*}{dc} = \frac{s_{0d}}{s_{md}^2} \frac{\partial s_{md}}{\partial c} < 0.$$

An increase in list price increases the rebate proportional to the change in manufacturer profit due to decreases in demand among non-enrolled diabetic patients. An increase in copay decreases the rebate proportional to the change in insurer profit due to changes in insurance demand and insurer drug costs.

Manufacturer. Since the manufacturer is held to their disagreement payoff, we can simplify the manufacturer profit to

$$\pi_{mfg} = \alpha p_L s_{0d}$$

With a \$1 decrease in the list price p_L , the manufacturer's disagreement option changes, and the change in manufacturer profit is

$$\frac{\partial \pi_{mfg}}{\partial (-p_L)} = -\alpha \left[s_{0d} + p_L \frac{\partial s_{0d}}{\partial p_L} \right].$$

This is negative when $s_{0d} > -p_L \partial s_{0d} / \partial p_L$, which occurs when patients are not very sensitive to out-of-pocket prices, the list price is low, or uninsured demand is already high.

With a \$1 decrease in copay, the manufacturer profit does not change, since the rebate adjusts to hold the manufacturer to the disagreement payoff.

Insurer. Writing p_m for the premium P , s_m^{diab} and $s_m^{nondiab}$ for user and non-user enrollment s_D and s_N , and λ_m for the premium sensitivity λ : since the insurer optimally sets premiums, the insurer is only impacted through the direct and bargaining channels.

$$\begin{aligned} \pi_m = \max_{p_m} & \alpha \cdot \underbrace{s_m^{diab} \cdot [p_m - (p_L(1-r) - c) \cdot s_{md}]}_{\text{Diabetic patients}} + \\ & (1 - \alpha) \cdot \underbrace{s_m^{nondiab} \cdot p_m}_{\text{Non-Diabetic patients}} \end{aligned}$$

Let $M \equiv p_m^* - (p_L(1-r) - c)s_{md}$ denote the insurer's margin per diabetic enrollee, and note that $\partial s_m^{diab} / \partial \Delta W = \lambda_m s_m^{diab} (1 - s_m^{diab})$, $\partial \Delta W / \partial p_L = s_{0d}$, and $\partial \Delta W / \partial c = -s_{md}$. A \$1 decrease in the list price changes insurer profit by

$$\begin{aligned} \frac{d\pi_m}{d(-p_L)} = & \underbrace{\alpha s_m^{diab} (1-r) s_{md}}_{\text{lower drug cost}} - \underbrace{\alpha \lambda_m s_m^{diab} (1 - s_m^{diab}) s_{0d} M}_{\text{lower enrollment}} \\ & - \underbrace{\alpha s_m^{diab} p_L s_{md} \cdot \frac{dr^*}{dp_L}}_{\text{lower rebate}} \end{aligned}$$

and a \$1 decrease in the copay changes it by

$$\frac{d\pi_m}{d(-c)} = \underbrace{-\alpha s_m^{diab} \left[s_{md} - (p_L(1-r) - c) \frac{\partial s_{md}}{\partial c} \right]}_{\text{higher cost per fill and more fills}} + \underbrace{\alpha \lambda_m s_m^{diab} (1 - s_m^{diab}) s_{md} M}_{\text{higher enrollment}} - \underbrace{\alpha s_m^{diab} p_L s_{md} \cdot \frac{dr^*}{dc}}_{\text{higher rebate}}.$$

A net price ceiling $\bar{k}$ does not change p_L or $D_0(p_L)$ and so leaves the manufacturer's outside option unchanged; the equilibrium becomes $\min\{k^*, \bar{k}\}$.

Proof of Proposition 5. The insurer's first-order condition is $F(P; u_D, \tau) \equiv \delta[s_D + s'_D(P - u_D - \tau)] + (1 - \delta)[s_N + s'_N(P - \tau)] = 0$. By the implicit function theorem, $\partial P^*/\partial u_D = -F_{u_D}/F_P = \delta s'_D/F_P$ and $\rho = \partial P^*/\partial \tau = -F_\tau/F_P = [\delta s'_D + (1 - \delta)s'_N]/F_P$. Dividing gives $\partial P^*/\partial u_D = \rho \omega_D$. Under the logit, $s'_g = -\lambda s_g(1 - s_g)$, so for both groups insurance demand is decreasing in the premium, and the premium is a function of the marginal cost per unit of insured drug demand, scaled by the total enrollment sensitivity to premium changes.

Proof of Corollary 1. Holding k fixed and ignoring the valuation shift, a \$1 copay reduction raises u_D by $D(c) - (k - c)D'(c)$, so $dP^*/d(-c) = \rho \omega_D [D(c) + (k - c)|D'(c)|]$. Substituting into (16): users' surplus rises when $D(c) > dP^*/d(-c)$, which holds since $\rho \omega_D < 1$ and induced fills are small, and aggregate consumer surplus falls when the stated inequality holds. With $s_D = s_N$, $\omega_D = \delta$ and $D'(c) = 0$, the inequality becomes $\delta s_D D(c) < s \rho \delta D(c)$, that is, $\rho > 1$.

Proof of Proposition 6. Summing profits, $\Pi_I + \Pi_M = \delta s_D [P + (c - m)D(c)] + (1 - \delta)s_N P + \delta(1 - s_D)(p_L - m)D_0$, so k cancels and $TS = \delta CS_D + (1 - \delta)CS_N + \Pi_I + \Pi_M$ depends on k only through P . Using $\partial CS_D/\partial c = -s_D D(c)$, $\partial CS_D/\partial P = -s_D$, and $\partial CS_N/\partial P = -s_N$,

$$\begin{aligned} \frac{\partial TS}{\partial c} \Big|_P &= \delta [-s_D D + s_D(D + (c - m)D')] + \delta \frac{\partial s_D}{\partial c} [P + (c - m)D - (p_L - m)D_0], \\ \frac{\partial TS}{\partial P} &= \delta s'_D \Omega_D + (1 - \delta)s'_N P. \end{aligned}$$

The total derivative is $\partial TS/\partial c|_P + (\partial TS/\partial P)(dP^*/dc)$.

Proof of Proposition 7. Under Assumption 1, s_D does not respond to P or c , so by Proposition 5 and the analogous argument for the valuation shift, P^* does not respond to k or c ; s_N is then fixed as well. Write $Q = \delta s_D D(c)$ and note $\Pi_I = SP - (k - c)Q$ and $\Pi_M = (k - m)Q$.

(a) This is Proposition 2(iii).

(b) With $P_k^* = 0$ and no cash market, Lemma 1 holds exactly: $k^u = m + (1 - \eta)J/Q$ with $J = \delta s_D[P + (c - m)D(c)] + (1 - \delta)s_N P - \Pi_I^0 + \varphi$. Hence $J/Q = c - m + B/D(c)$ with $B = (SP - \Pi_I^0 + \varphi)/(\delta s_D)$ independent of c , and $dk^u/dc = (1 - \eta)[1 - BD'(c)/D(c)^2] = (1 - \eta)[1 + \epsilon_c B/(cD(c))] = \kappa$. For a \$1 reduction in c : consumer surplus rises by $\delta s_D D(c) = Q$ (users) and is unchanged for non-users. $\Delta \Pi_M = -Q\kappa + (k - m)\delta s_D |D'(c)|$ by differentiating $(k - m)\delta s_D D(c)$. Differentiating $\Pi_I = SP - (k - c)\delta s_D D(c)$ gives $d\Pi_I/dc = (1 - \kappa)Q + (k - c)\delta s_D |D'(c)|$, so a \$1 reduction changes insurer profit by $-(1 - \kappa)Q - (k - c)\delta s_D |D'(c)|$. Summing gives $\Delta TS = (c - m)\delta s_D |D'(c)|$.

(c) With c fixed, a ceiling θp_L lowers k from k^* to $\min\{k^*, \theta p_L\}$ and, by (a), Q is unchanged, so net spending falls by $Q(k^* - \theta p_L)^+ = p_L Q(1 - r - \theta)^+$. A copay cap $\bar{c}$ changes consumer surplus by $\delta [CS_D(\bar{c}) - CS_D(c)]$ at fixed P , and $\partial CS_D/\partial c = -s_D D(c)$ with s_D fixed, which integrates to (21).

B Additional Results

B.1 Background Exhibits

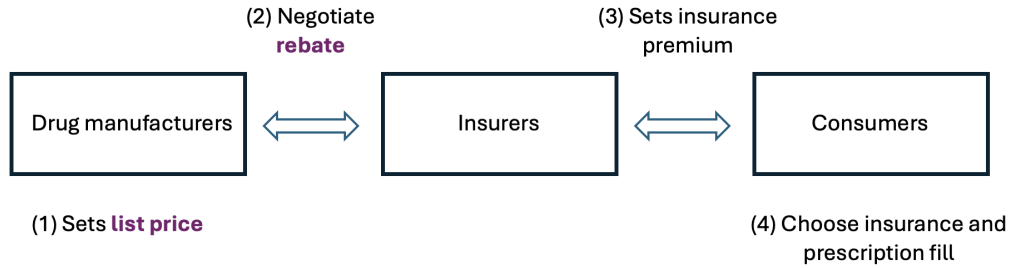


Figure A1: The Vertical Pricing Chain for a Branded Drug

B.2 Benchmark Model

B.2.1 Simulated Example

We illustrate the benchmark model of Section 3 graphically using preset values.

We set $s(x) = (1 - x)^\kappa$ and set $W(x) = \frac{(1-x)^{\kappa+1}}{\kappa+1}$, where κ governs demand elasticity and $W'(x) = -s(x)$. We set insurer market power $\alpha = 0.5$, demand elasticity $\kappa = 0.5$. We set copay $c = 0.18$ in the first case and list price $p = 0.6$ in the second case.

Figure A2 illustrates how welfare changes when list price changes. In case 1, when the manufacturer has bargaining power, changes in list price do not change social welfare but do redistribute surplus. Insurer welfare does not change since the insurer is held at its partici-

Table A1: Instruments, the Prices They Regulate, and Their Scope

Policy		Price regulated	Scope	Model object
Insulin cost-sharing cap		Patient out-of-pocket price per 30-day supply	Covered insulin products in Part D and Part B; conditional on the plan covering the product	Copay c
Part D annual OOP cap		Patient liability in the tail of annual spending	All Part D drugs	Outside the static model
Maximum fair price		Price the manufacturer may charge for Medicare use, benchmarked to the prior net price	Selected single-source drugs without generic or biosimilar competition; Medicare only	Ceiling on k
Most-favored-nation agreements		Medicaid net prices, direct-to-consumer cash prices, launch prices	Participating manufacturers; channel-specific	Ceiling on k in one channel; cash price in another
State upper payment limits		Price payers may pay in the state	Selected drugs; Colorado's first limit is enjoined	Ceiling on k
Inflation rebates; Medicaid rebate-cap removal		List price, through a fiscal penalty on its level and growth	All payers; drove the 2023–24 insulin list-price cuts of 70%–78%	Environment: p_L

Notes: From 2026 the insulin copay cap is the lesser of \$35, 25% of the maximum fair price, and 25% of the plan's negotiated price, which links the first and third rows. The model's two instruments are the copay c and a net price ceiling, k ; the list price p_L is a parameter of the environment that matters through cash purchases.

Table A2: Estimated Effects of the Part D Senior Savings Model (\$35 Insulin Copay Cap)

Outcome	MA-PD		PDP	
	2021	2022	2021	2022
<i>Insulin users</i>				
30-day insulin fills per year	0.85	0.74	0.82	1.05
Annual OOP drug costs (\$)	−214	−198	−364	−426
Annual OOP plus premium (\$)	−209	−199	−309	−319
Enrollment in participating plans (%)	27.4	36.6	74.8	92.2
<i>Non-users</i>				
Annual OOP drug costs (\$)	16	27	−18	−40
Annual OOP plus premium (\$)	17	24	30	65
<i>Manufacturers and Medicare (\$ per member-month)</i>				
Drug rebates	2.27	3.21	7.49	16.00
Coverage-gap discounts	1.84	2.76	4.06	7.96
Part D costs to Medicare	−4.74	−6.51	−9.33	−19.00

Notes: Difference-in-differences estimates for participating relative to comparison plans, from [CMS \(2025\)](#). MA-PD: Medicare Advantage prescription drug plan; PDP: stand-alone prescription drug plan. Non-user premium changes can be computed as the difference between the second and first non-user rows.

Table A3: Payoffs in the Benchmark Model

	Agree (drug covered at net price k)	Disagree
Manufacturer	$k D(c)$	$p D(p)$
Insurer	$\underbrace{[\alpha (W(c) - W(p)) + (1 - \alpha) (k - c) D(c)]}_{\text{Premium}} - (k - c) D(c)$	0
Consumers	$W(c) - \underbrace{[\alpha (W(c) - W(p)) + (1 - \alpha) (k - c) D(c)]}_{\text{Premium}}$	$W(p)$

Notes: The manufacturer's welfare is its revenue from drug sales. The insurer's welfare is its revenue from premiums minus its costs. Each consumer's welfare is their expected value from the drug minus their premium.

pation constraint, and consumer welfare decreases due to a worse outside option, so all gains accrue to the manufacturer. In case 2, when the insurer has bargaining power, the manufacturer is held to its disagreement payoff $p \cdot s(p)$, so changes in list price affect both how surplus is divided and how large it is relative to the outside option, generating potential nonlinear welfare effects. For example, at low p , manufacturer outside option may be improving as prices increase without changing demand; at high p , demand may decline rapidly, thus harming their outside option. As a result, manufacturers still generally benefit from higher prices, but the insurer and consumers share the remaining surplus, with incidence depending on demand elasticity.

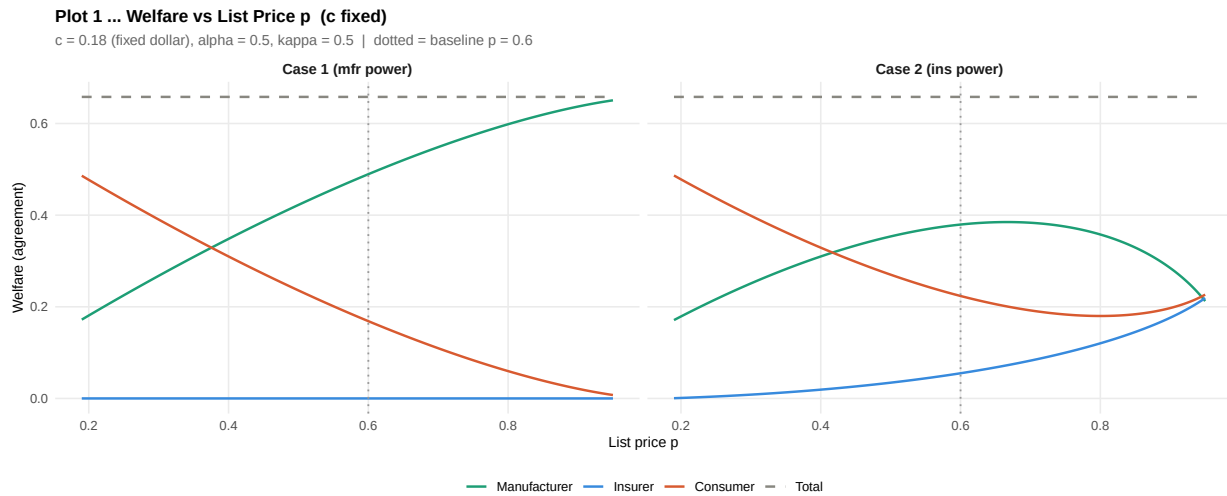


Figure A2: Change in Welfare by List Price

Figure A3 shows how welfare changes as the copay increases. In both cases, total social welfare declines because a higher copay reduces drug utilization $s(c)$, lowering consumer value $W(c)$ and generating a standard deadweight loss. When the manufacturer has bargaining power, it holds the insurer and consumers to their participation constraints, so all of this welfare loss is borne by the manufacturer. When the insurer has bargaining power, the manufacturer is held to its disagreement payoff and is therefore unaffected by the copay, while the insurer and consumers share the welfare loss as higher copays reduce the total surplus available from coverage.

Figures A4 and A5 show how welfare effects further vary by insurer market power α . Figure A4 shows that insurer market power mostly affects consumer welfare when the insurer also has bargaining power: when insurers have both full bargaining and market power, they can extract a larger share of the surplus from consumers through premiums, so the surplus generated from very high list price (through worse outside option for manufacturers) primarily benefits the insurer rather than consumers. In contrast, when insurer market power is low,

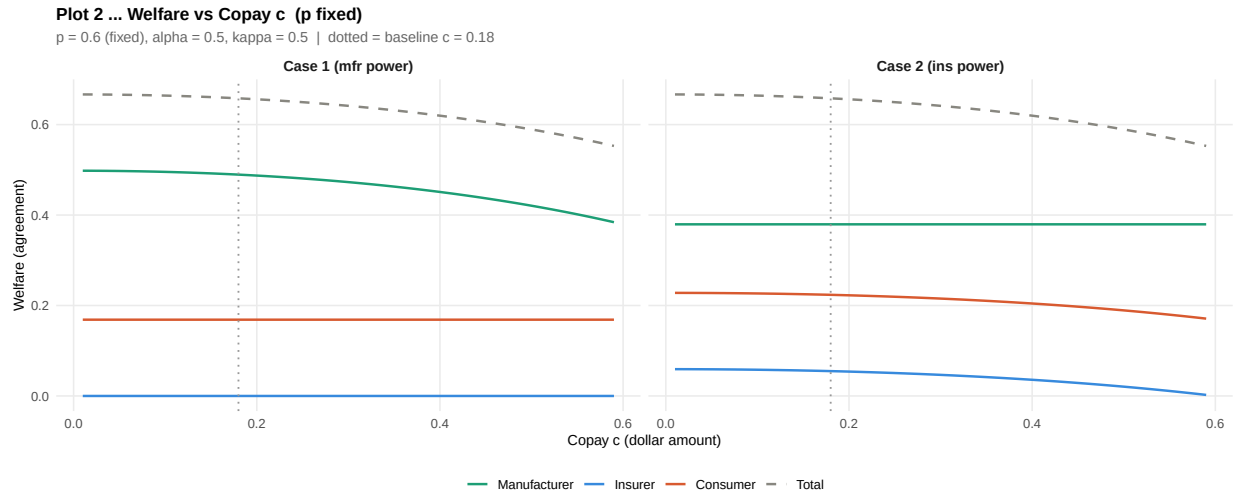


Figure A3: Change in Welfare by Copay

consumers retain a larger share of the remaining surplus, and are therefore less adversely affected by changes in list prices. Figure A5 shows that similarly, insurer market power plays a role in determining the surplus between insurer and consumer when the insurer also has bargaining power.

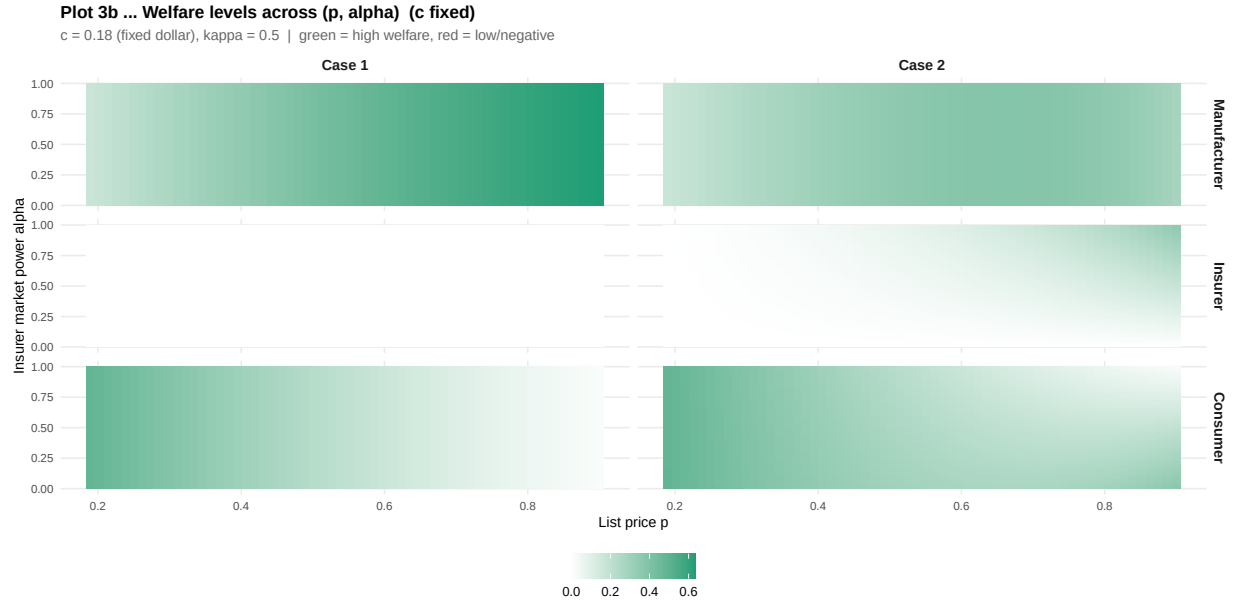


Figure A4: Welfare by List Price and Insurer Market Power

Figures A6 and A7 show how premiums and the share of patients choosing the outside option varies by regulation. Figure A6 shows that premium changes are larger when the manufacturer has all bargaining power, since the rebate is reduced as list prices fall, which lowers

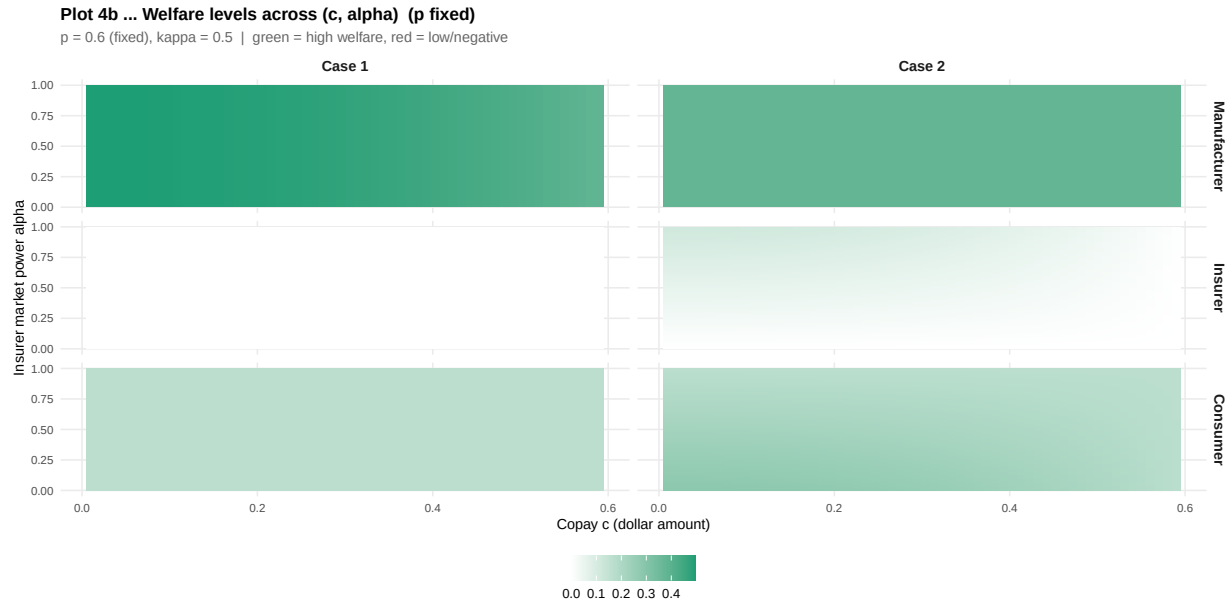


Figure A5: Welfare by Copay and Insurer Market Power

the insurer's net cost of coverage and the premium it charges. When the insurer has all bargaining power, premium falls when list price decreases as the value of coverage falls. Figure A7 shows that the policies affect different groups of consumers. In the top panel, the value of coverage grows as the list price increases, since consumers' outside options are worsened. In the bottom panel, the value of coverage grows as copay decreases since consumers' gains-from-coverage increases.

This simulation shows that regulations targeting different parts of the drug pricing chain have different welfare effects, and these effects depend on several factors including the insurer's relative bargaining power (Case 1 vs. Case 2) and market power (α).

Preferred instrument by agent. In the benchmark we can also ask which of a \$1 decrease in the list price and a \$1 decrease in the copay each agent would prefer. This comparison treats the list price as a policy lever and compares increments that are not comparable policies, so the main text uses the consumer gain per dollar extracted from the manufacturer instead (Section 4.7); it is useful nonetheless because it shows how the ranking depends on bargaining power and demand elasticity. Different drugs may require different policy designs. For example, it may be optimal to institute copay caps for drugs with elastic demand, while regulating list prices when drugs have inelastic demand. Table A4 summarizes the preferred instrument under each scenario.

Plot 5 ... Premium by policy variable and bargaining case

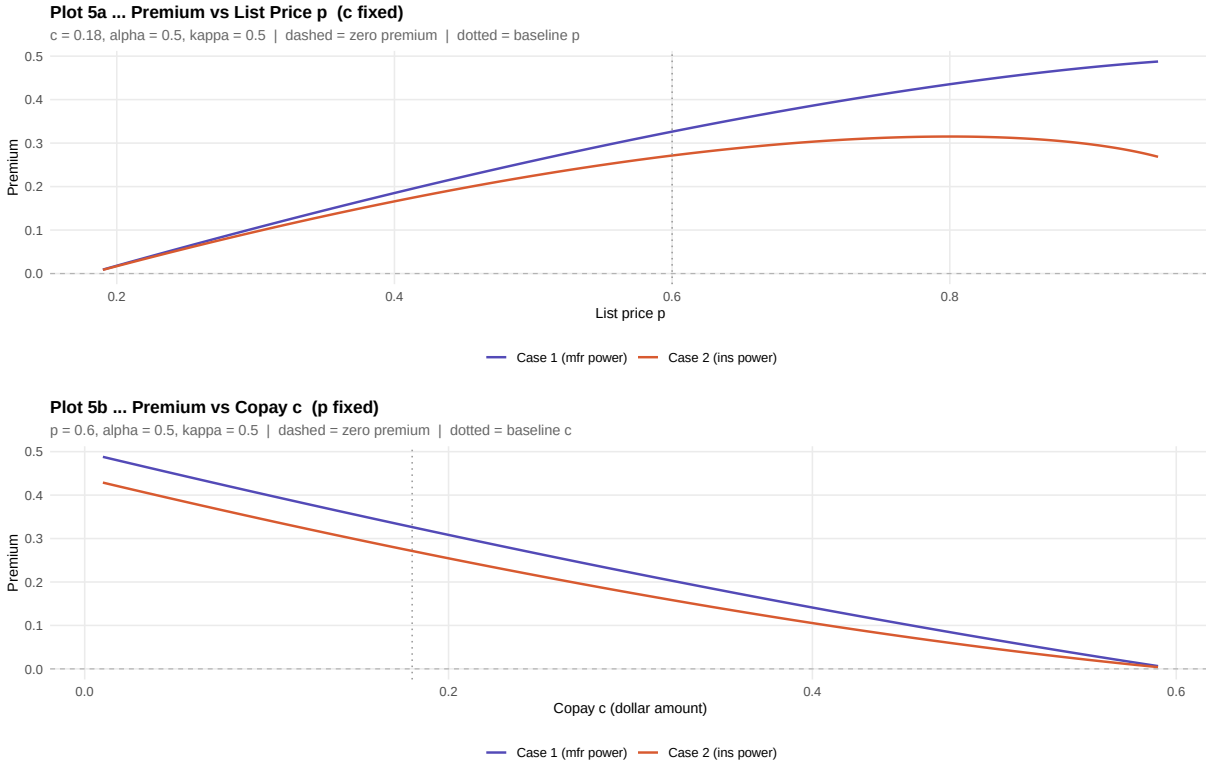


Figure A6: Premium by Regulation

Table A4: Taxonomy of Preferred Regulatory Instrument by Agent and Bargaining Regime

Beneficiary	Case 1: Manufacturer Power	Case 2: Insurer Power	Notes
Consumer	List Price <i>Unambiguous</i>	List Price iff: $s(p)(1 - (1 - \alpha)\epsilon_p) > (1 - \alpha)\epsilon_c s(c)$	Depends on comparison of demand and elasticity at c vs p
Manufacturer	Copay <i>Unambiguous</i>	List Price iff: $\epsilon_p > 1$ (where $\epsilon_p = \frac{-ps'(p)}{s(p)}$)	Copay (Since $\epsilon_p < 1$ empirically)
Insurer	Indifferent ($\Delta \text{Welfare} = 0$)	Copay <i>Unambiguous</i>	Copay (Monetizes plan upgrade)

Notes: Table summarizes the sign of $\Delta \text{Welfare}_{\text{List}} - \Delta \text{Welfare}_{\text{Copay}}$ for a \$1.00 policy cut. The last column evaluates the analytical conditions under the pharmaceutical literature's consensus that branded drug demand is price-inelastic near the baseline list price.

Plot 6 ... Share not purchasing (outside option) by policy variable

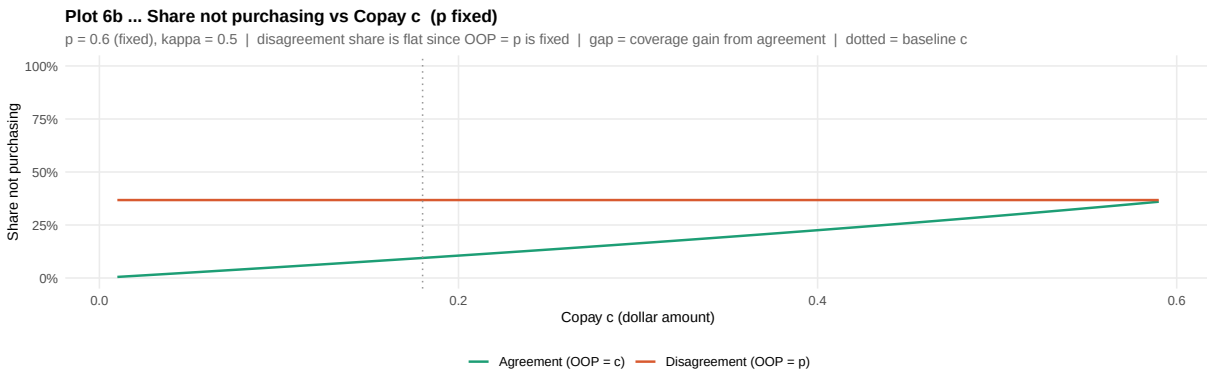
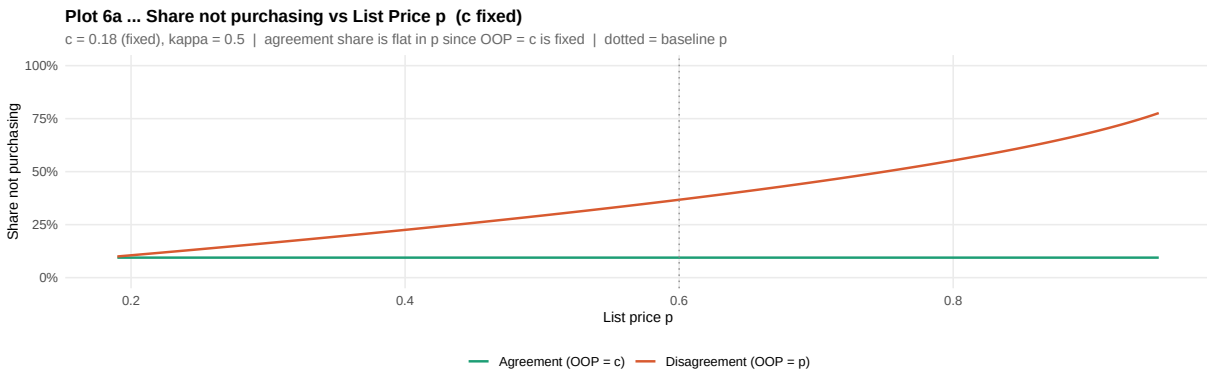


Figure A7: Non-Purchase Share by Regulation

Case 1: Manufacturer power. Suppose the manufacturer has the entire bargaining power. The consumer is always better off under a list price regulation than a copay regulation, since manufacturer passes on the lower list price due to consumers' improved outside option. The manufacturer is always better off under a copay cut, since it captures the expansion in patient demand through rebate negotiations. The insurer is indifferent since it is always pinned to its outside option through rebate negotiations.

Case 2: Insurer power. Suppose the insurer has the entire bargaining power. The manufacturer is better off with a change in list price if consumers' drug demand at the list price is elastic ($\frac{-ps'(p)}{s(p)} > 1$). Decreasing list price is preferable if the loss in per-unit insurer payment is offset by changes in consumers choosing the outside option of paying the full list price. However, since drug demand is often documented to be inelastic in the area around the list price, this condition will often not hold, and manufacturers will prefer a copay cut in most cases. For insurers, a copay cut is always preferable to a list price reduction. A copay cut increases the number of prescription fills from insured patients, and the insurer can exercise market power to increase premiums. In comparison, a list price reduction decreases the per-fill payment the insurer is responsible for, but it also increases the attractiveness of consumers' outside option, forcing the insurer to also lower premium payments.

For consumers a list price reduction is preferable to a copay cut if $s(p) > -(1 - \alpha)(c's(c) + ps'(p))$. That is, consumers are better off under a list price reduction if the decrease in prices faced by the uninsured population outweighs the net change in premiums faced by the insured population (premium hike due to the copay cut, and premium decrease due to the list price decrease).

B.2.2 What Changes Relative to the Benchmark

Two features of the benchmark account for the inversion of the instrument ranking between the benchmark and the full model (Section 4.7). First, its upstream price works through a large cash margin. Under disagreement, consumers buy at the list price with probability 0.63, against 0.91 when covered, so $D_0/D(c) = 0.70$ and a lower list price forces the manufacturer to concede. Our baseline sets this margin to zero and the cash extension to 3.6%, and a net price ceiling does not operate through it at all. Second, the benchmark's premium mechanically returns a share $1 - \alpha$ of any surplus to consumers, so an insurer's saving is shared and a copay cut is clawed back. In the full model the premium is set by a profit-maximizing insurer and, by Proposition 5, responds to a drug-specific cost only in proportion to users' share of marginal enrollees. A copay cut is therefore a transfer that users keep, and a ceiling's saving stays with the insurer, unless users are marginal (Table 7).

Table A5: What Each Instrument Can Deliver to Consumers

Policy at maximum stringency	Δ Consumer surplus	Δ Manufacturer profit	Δ Insurer profit	Consumer gain per \$1 extracted
<i>A. Benchmark, manufacturer makes the offer</i> (per consumer)				
Upstream price down to the copay	+0.326	-0.326	0.000	1.00
Copay to zero	+0.000	+0.009	0.000	—
<i>B. Benchmark, insurer makes the offer</i> (per consumer)				
Upstream price down to the copay	+0.271	-0.216	-0.055	1.25
Copay to zero	+0.004	0	0.004	—
<i>C. Full model, calibrated</i> (\$ per beneficiary-year)				
Upstream price to zero	+0.04	-11.38	+11.38	0.003
Copay to zero	+10.79	-5.15	-5.15	2.10

Notes: Panels A and B evaluate Proposition 1 at $D(x) = (1 - x)^{1/2}$, $\alpha = 0.5$, $p = 0.6$, $c = 0.18$; the upstream price is the list (cash) price, which cannot fall below the copay without destroying the gains from coverage. Panel C is the calibrated model, with the upstream price the net price ceiling, driven to zero. The last column is R in equation (19); it is undefined where the manufacturer does not lose. Evaluated at marginal rather than maximal policies, R is 2.22 for a \$1 copay cut and 0.003 for a ceiling at 75% of the bargained price.

B.3 Channel-by-Channel Comparison of a \$1 List-Price Cut and a \$1 Copay Cut

This appendix compares the two levers channel by channel, holding each equilibrium object fixed in turn, which complements the propositions of Section 4 by signing each channel separately for each party. It uses a notation that distinguishes diabetic from non-diabetic enrollees explicitly; the mapping to the main text is: s_m^{diab} and $s_m^{nondiab}$ are user and non-user enrollment (s_D, s_N); s_{md} and s_{0d} are insured and cash demand ($D(c), D_0(p_L)$); p_m is the premium P ; r is the rebate, with net price $k = p_L(1 - r)$; α is the user share δ ; λ_m is the premium sensitivity λ ; and GFT_d and GFT_m are the manufacturer's and insurer's gains from agreement. The comparison sets a \$1 decrease in the list price against a \$1 decrease in the copay, increments the main text does not treat as comparable policies, and it treats the list price as a lever; the main text instead compares a net price ceiling with a copay cap per dollar extracted from the manufacturer. The three-channel decomposition that this comparison applies is stated in Section 4, equation (8).

B.3.1 Notation and Setup

Consider a setting where

- Patients consist of a diabetic share α and a non-diabetic share $1 - \alpha$. All patients choose whether to enroll in insurance, while diabetic patients additionally decide whether to purchase the drug d .
- A single plan m operates under community rating, requiring a uniform premium p_m .

Premiums p_m are endogenously determined by the insurer to maximize profit, contingent on the negotiated rebate r and exogenous copay c (in dollars, not coinsurance).

- The manufacturer and insurer negotiate a rebate r for drug d , with list price p_L .
- Insurance enrollment and drug purchase probabilities are endogenous. Specifically, premium p_m , which depends on the negotiated rebate r , influences insurance enrollment decisions. Drug purchase probabilities vary depending on an individual's insurance choice.
- The analysis considers two levers: the list price p_L and the copay c .

Stage 4: Consumer Demand for Drugs. Consumers choose whether to purchase the drug based on their insurance status. Let the probability of drug purchase conditional on insurance choice among diabetics be denoted by

$$s_{md}(c) = \frac{\exp[\lambda_d(u_{md} - c)]}{1 + \exp[\lambda_d(u_{md} - c)]}, \quad s_{0d}(p_L) = \frac{\exp[\lambda_d(u_{0d} - p_L)]}{1 + \exp[\lambda_d(u_{0d} - p_L)]}.$$

where u_{md}, u_{0d} are the dollar values from drug consumption that can vary by insurance status, λ_d is patients' sensitivity to out-of-pocket drug prices.

Patients' value of drug coverage under insurance and no insurance can be expressed as

$$W_m(c) = \frac{1}{\lambda_d} \log(1 + \exp[\lambda_d(u_{md} - c)])$$

$$W_0(p_L) = \frac{1}{\lambda_d} \log(1 + \exp[\lambda_d(u_{0d} - p_L)])$$

Stage 3: Consumer Demand for Insurance. Consumers consider the expected value of drug purchases when choosing insurance. Denote $\Delta W(c, p_L) = W_m(c) - W_0(p_L)$ as the value of drug coverage provided by insurance m for diabetic patients. Given premiums p_m , diabetic patients' insurance demand is

$$s_m^{diab}(\Delta W, p_m) = \frac{\exp[\lambda_m(\Delta W - p_m)]}{1 + \exp[\lambda_m(\Delta W - p_m)]}.$$

where λ_m is patients' price sensitivity with respect to premiums.

Non-diabetic patients may still derive value from insurance. Let γ denote their value of

insurance (e.g., from covering other drugs), then their insurance demand is

$$s_m^{nondiab}(\gamma, p_m) = \frac{\exp[\lambda_m(\gamma - p_m)]}{1 + \exp[\lambda_m(\gamma - p_m)]}.$$

For both patient groups, insurance demand is decreasing in premiums, with $\partial s_m^g / \partial p_m = -\lambda_m s_m^g (1 - s_m^g)$ for $g \in \{diab, nondiab\}$.

Stage 2: Insurer Premium Setting. Under community rating, the insurer sets the premium p_m to maximize profit π_m , which is a function of enrollment $\{s_m(\Delta W(c, p_L), p_m(r)), s_m(\gamma, p_m(r))\}$, negotiated rebate r , copay c , and drug demand $\{s_{md}, s_{0d}\}$:

$$\begin{aligned} \pi_m = \max_{p_m} & \underbrace{\alpha \cdot s_m^{diab} \cdot [p_m - (p_L(1 - r) - c) \cdot s_{md}]}_{\text{Diabetic patients}} + \\ & (1 - \alpha) \cdot \underbrace{s_m^{nondiab} \cdot p_m}_{\text{Non-Diabetic patients}} \end{aligned}$$

where $p_L(1 - r) - c$ reflects the insurer's per-unit payment net of rebates and patient cost sharing.

The optimal premium p_m^* solves the first-order condition:

$$\begin{aligned} p_m &= \rho \cdot \alpha s_m^{diab'} [(p_L(1 - r) - c)s_{md}] - \frac{\alpha s_m^{diab} + (1 - \alpha)s_m^{nondiab}}{\alpha \frac{\partial s_m^{diab}}{\partial p_m} + (1 - \alpha) \frac{\partial s_m^{nondiab}}{\partial p_m}} \\ \rho &= \frac{1}{\alpha \frac{\partial s_m^{diab}}{\partial p_m} + (1 - \alpha) \frac{\partial s_m^{nondiab}}{\partial p_m}} \end{aligned}$$

where premium is a function of the marginal cost per unit of insured drug demand, scaled by the total enrollment sensitivity to premium changes.

Stage 1: Rebate Bargaining. The manufacturer and insurer bargain over the rebate rate r . The equilibrium rebate r^* maximizes the Nash product:

$$r^*(c, p_L) = \arg \max_r [(GFT_d)^{1-\eta} \cdot (GFT_m)^\eta]$$

where η is the insurer's bargaining weight.

In disagreement, plan m does not cover drug d , and the insurer sets the premium p_m^D that

maximizes profit without drug costs:

$$p_m^D = \arg \max_{p_m} p_m \left[\alpha s_m^{diab}(0, p_m) + (1 - \alpha) s_m^{nondiab}(\gamma, p_m) \right].$$

Let $s_m^{g,D} \equiv s_m^g(\cdot, p_m^D)$ denote the enrollment for $g \in \{diab, nondiab\}$ in disagreement. All patients, enrolled or not, then pay the list price p_L for the drug. The gains from trade for the manufacturer are the differences in expected per-enrollee profit:

$$\begin{aligned} GFT_d &= \underbrace{\alpha \left[s_m^{diab}(p_m^*(r)) p_L (1 - r) s_{md} + (1 - s_m^{diab}(p_m^*(r))) p_L s_{0d} \right]}_{\text{agreement profit}} - \underbrace{\alpha p_L s_{0d}}_{\text{disagreement profit}} \\ &= \alpha s_m^{diab}(p_m^*(r)) p_L \left[\underbrace{(1 - r) s_{md}}_{\text{expected unit profit in agreement}} - \underbrace{s_{0d}}_{\text{expected unit profit in disagreement}} \right] \end{aligned}$$

The gains from trade for the insurer are the difference in profit with coverage and the premium-only profit without coverage:

$$GFT_m = \underbrace{\pi_m(r, p_m^*(r))}_{\text{agreement profit}} - \underbrace{p_m^D \left[\alpha s_m^{diab,D} + (1 - \alpha) s_m^{nondiab,D} \right]}_{\text{disagreement profit via premiums}}$$

Here the manufacturer gains on each enrollee the margin between the rebated insured price and the cash price, and the insurer gains the difference between its profit with coverage and its premium-only profit without it.

We first define welfare for diabetic and non-diabetic patients. Insurer and drug manufacturer surplus are given by their profit functions.

Diabetic patients. The welfare function (in dollars) for diabetic patients is

$$CS^{diab}(r) = \frac{1}{\lambda_m} \log (\exp [\lambda_m (W_m(c) - p_m^*(r))] + \exp [\lambda_m W_0(p_L)])$$

where λ_m is patients' sensitivity to premiums in insurance choice.

Non-diabetic patients. The welfare function (in dollars) for non-diabetic patients is

$$CS^{nondiab}(\gamma, r) = \frac{1}{\lambda_m} \log (\exp [\lambda_m (\gamma - p_m^*(r))] + 1)$$

where λ_m is patients' sensitivity to premiums in insurance choice. We assume that non-diabetics derive 0 value from being uninsured.

B.3.2 Comparing a \$1 List-Price Cut and a \$1 Copay Cut

To understand the “optimal policy” for each agent, we compare the change in welfare from a \$1 decrease in list price p_L and copay c , channel by channel.

Direct effects. We first consider the direct effects channel only. *Diabetic enrollees.* Insured patients face a fixed OOP cost c regardless of p_L , so the welfare change from p_L is zero. Uninsured patients pay full price p_L with no copay exposure. This results in the following direct effects for a \$1 decrease in p_L or c :

$$\left. \frac{\partial CS^{diab}}{\partial(-p_L)} \right|_{r,p_m} = (1 - s_m^{diab})s_{0d}, \quad \left. \frac{\partial CS^{diab}}{\partial(-c)} \right|_{r,p_m} = s_m^{diab}s_{md}$$

Then, the direct effect favors a \$1 list-price decrease over a \$1 copay decrease iff

$$(1 - s_m^{diab})s_{0d} > s_m^{diab}s_{md}$$

which occurs whenever the uninsured cash-pay demand $((1 - s_m^{diab})s_{0d})$ is larger than the insured drug demand $(s_m^{diab}s_{md})$. Intuitively, a decrease in p_L only helps the uninsured group, while a decrease in c helps the (usually larger) insured group directly.

Non-diabetic enrollees. Non-diabetic enrollees’ welfare do not directly depend on the insurance’s drug coverage ΔW , so,

$$\frac{\partial CS^{nondiab}}{\partial p_L} = \frac{\partial CS^{nondiab}}{\partial c} = \left. \frac{\partial CS^{nondiab}}{\partial r} \right|_{p_m} = 0$$

They are only impacted through how premium changes from the bargaining channel and premium channels: non-diabetic patients may be more harmed from an increase in list price if it is passed through to the premiums via negotiated rates or costs.

Insurer. Since the insurer’s net cost is $p_L(1-r)-c$, a \$1 decrease in list price lowers the insurer’s cost by $1-r$ per unit, while a \$1 decrease in copay raises the insurer’s cost by a full dollar per unit, since the insurer now absorbs what the patient used to pay. The insurer therefore prefers a decrease in list price over a decrease in copay.

Manufacturer. For the manufacturer, only the list price is part of its direct profit function; a decrease in p_L directly reduces revenue per unit. Conversely, a decrease in c only affects profitability through behavioral changes in insurance and drug demand. Therefore, the manufacturer prefers a \$1 decrease in copay over a \$1 decrease in list price, as the latter directly

reduces its marginal revenue.

Specifically, holding r and p_m fixed, a list price change impacts the per-unit revenue, plus a drug demand response as s_{md} , s_{0d} adjust to the new price, and an insurance demand response as s_m^{diab} adjusts. Since a change in copay has no direct revenue effect for the manufacturer, it only enters through changes in insured drug demand s_{md} and insurance demand s_m^{diab} :

$$\begin{aligned}
\left. \frac{\partial \pi_{mfg}}{\partial p_L} \right|_{r,c,p_m} &= \underbrace{\alpha [s_m^{diab}(1-r)s_{md} + (1-s_m^{diab})s_{0d}]}_{\Delta \text{Revenue}} \\
&\quad + \underbrace{\alpha \left[s_m^{diab}(p_L(1-r) - mc) \frac{\partial s_{md}}{\partial p_L} + (1-s_m^{diab})(p_L - mc) \frac{\partial s_{0d}}{\partial p_L} \right]}_{\Delta \text{Insured demand}} \\
&\quad + \underbrace{\alpha \frac{\partial s_m^{diab}}{\partial \Delta W} \cdot \frac{\partial \Delta W}{\partial p_L} \cdot [(p_L(1-r) - mc)s_{md} - (p_L - mc)s_{0d}]}_{\Delta \text{Enrollment (via } \Delta W)} \\
\left. \frac{\partial \pi_{mfg}}{\partial c} \right|_{r,p_L,p_m} &= \underbrace{\alpha s_m^{diab}(p_L(1-r) - mc) \frac{\partial s_{md}}{\partial c}}_{\Delta \text{Insured demand}} \\
&\quad + \underbrace{\alpha \frac{\partial s_m^{diab}}{\partial \Delta W} \cdot \frac{\partial \Delta W}{\partial c} \cdot [(p_L(1-r) - mc)s_{md} - (p_L - mc)s_{0d}]}_{\Delta \text{Enrollment (via } \Delta W)}
\end{aligned}$$

Premium channel. To add in the premium channel, we make the following parametric assumptions to derive $\frac{\partial P}{\partial c}$, $\frac{\partial P}{\partial p_L}$:

1. **Logit insurance demand**, with a common price-sensitivity parameter λ_m across diabetics and non-diabetics (community rating implies both groups react to the same p_m):

$$\frac{\partial s_m^{diab}}{\partial p_m} = -\lambda_m s_m^{diab}(1 - s_m^{diab}), \quad \frac{\partial s_m^{nondiab}}{\partial p_m} = -\lambda_m s_m^{nondiab}(1 - s_m^{nondiab})$$

2. **Insurer's second-order condition holds** at p_m^* : $\partial^2 \pi_m / \partial p_m^2 < 0$. This is a maintained regularity assumption and guarantees a unique interior optimum.

Then, we can sign the insurer pass-through terms:

$$\rho_c = \left. \frac{\partial P}{\partial c} \right|_r < 0, \quad \rho_{p_L} = \left. \frac{\partial P}{\partial p_L} \right|_r > 0$$

Diabetic enrollees. Adding to the direct effect channel:

$$\begin{aligned}
(p_L \downarrow \$1) &\rightarrow \underbrace{(1 - s_m^{diab})s_{0d}}_{\text{Direct effect} > 0} + \underbrace{s_m^{diab}\rho_{p_L}}_{\text{Premium channel} > 0} > 0 \\
(c \downarrow \$1) &\rightarrow \underbrace{s_m^{diab} \cdot s_{md}}_{\text{Direct effect} > 0} + \underbrace{s_m^{diab}\rho_c}_{\text{Premium channel} < 0}
\end{aligned}$$

A copay cut directly improves diabetic patients' welfare by increasing the value of drug coverage, but it also raises the premium they pay ($\rho_c < 0$), partially offsetting the gain. Comparing the two levers, a cut in list price increases diabetic patients' welfare more if:

$$(1 - s_m^{diab})s_{0d} > s_m^{diab}[s_{md} - \rho_{p_L} + \rho_c]$$

In addition to comparing the size of the insured diabetic population, the optimal policy also relies on how much the insurer passes through a change in the copay compared to list price.

Non-diabetic enrollees. Since non-diabetic enrollees have no direct effect, the premium channel shows that a list price cut would improve their welfare:

$$\begin{aligned}
(p_L \downarrow \$1) &\rightarrow s_m^{nondiab}\rho_{p_L} > 0 \\
(c \downarrow \$1) &\rightarrow s_m^{nondiab}\rho_c < 0
\end{aligned}$$

Insurer. Since p_m^* maximizes π_m for a given r , then the **premium channel** is 0 and $\frac{\partial \pi_m}{\partial p_m} = 0$.

Manufacturer. Define the gap in profitability per insured and uninsured patients as Gap, then:

$$\begin{aligned}
(p_L \downarrow \$1) &\rightarrow \underbrace{-\alpha[s_m^{diab}(1-r)s_{md} + (1 - s_m^{diab})s_{0d}]}_{\text{Direct effect} < 0} + \underbrace{\alpha\lambda_m s_m^{diab}(1 - s_m^{diab})\text{Gap} \cdot \rho_{p_L}}_{\text{Premium channel}} \\
(c \downarrow \$1) &\rightarrow \underbrace{-\alpha s_m^{diab}(p_L(1-r) - mc)\frac{\partial s_{md}}{\partial c}}_{\text{Direct effect} > 0} + \underbrace{\alpha\lambda_m s_m^{diab}(1 - s_m^{diab})\text{Gap} \cdot \rho_c}_{\text{Premium channel}}
\end{aligned}$$

The premium channel now works in opposite directions on the two levers depending on the sign of Gap: if insured diabetics are more profitable to the manufacturer than cash-pay diabetics ($\text{Gap} > 0$), a list-price cut's premium-induced enrollment gain gives the manufacturer a partial offset to its direct loss (since $\rho_{p_L} > 0$, while a copay cut's premium-induced enrollment cuts into some of the direct effect gain (since $\rho_c < 0$). Accounting for the premium channel, whether a copay or list price cut is better for the manufacturer depends on the sign and magnitude of the profitability gap between insured and uninsured diabetic patients.

Bargaining channel. Similar to the motivating example, to bound the potential effects of the bargaining channel, we examine the two extreme cases: $\eta = 1$, where the insurer has all the bargaining power and the rebate r maximizes GFT_m , and $\eta = 0$, where the manufacturer has all the bargaining power.

Insurer bargaining power. In the first case, we assume $\eta = 1$, which implies that

$$r^*(c, p_L; \eta = 1) = 1 - \frac{s_{0d}(p_L)}{s_{md}(c)}$$

$$\frac{dr^*}{dp_L} = -\frac{1}{s_{md}} \frac{\partial s_{0d}}{\partial p_L} > 0, \quad \frac{dr^*}{dc} = \frac{s_{0d}}{s_{md}^2} \frac{\partial s_{md}}{\partial c} < 0$$

The manufacturer's participation constraint pins r^* so that the revenue per insured diabetic patient is the same as the revenue per uninsured diabetic patient (outside option). When the list price increases, fewer uninsured patients purchase the drug, and the rebate increases to keep the manufacturer indifferent. When the copay increases, the insured patients are harmed, so the rebate decreases to make the manufacturer indifferent between the insured revenue and uninsured revenue.

To evaluate the bargaining channel effects, we see that $\frac{\partial V}{\partial r}$ is only nonzero for the manufacturer and insurer. We can reuse the expressions for $\frac{\partial V}{\partial p_m}$ and note that $\frac{\partial P}{\partial r} = -\rho \cdot \alpha \cdot s_m^{diab'}$. $p_L \cdot s_{md} < 0$:

1. Diabetic and non-diabetic patients: The sign of the bargaining channel is dictated by $\frac{dr^*}{dx}$, so the bargaining channel is positive with a cut in copay and negative with a cut in list price.
2. Insurer With the envelop theorem, the insurer's bargaining channel is $\frac{\partial \pi_m}{\partial r} \frac{dr^*}{dx}$, where

$$\left. \frac{\partial \pi_m}{\partial r} \right|_{p_m^*} = \alpha s_m^{diab} p_L s_{md} \geq 0$$

Similar to the patients, the bargaining channel is positive with a cut in copay, since it raises insurance demand and worsens the manufacturer's outside option. It is negative with a cut in the list price.

3. Manufacturer The bargaining channel for the manufacturer can be written as

$$\left[\underbrace{-\alpha s_m^{diab} p_L s_{md}}_{\text{direct rebate cost} < 0} + \underbrace{\alpha \frac{\partial s_m^{diab}}{\partial p_m} \cdot \text{Gap} \cdot \frac{\partial P}{\partial r}}_{\text{rebate-induced premium effect}} \right] \cdot \frac{dr^*}{dx}$$

where the sign of the rebate-induced premium effect depends on the sign of the insured-uninsured profit gap and $\frac{dr^*}{dx}$.

Table A6 summarizes the three channels, cumulatively, for the case where $\eta = 1$.

Agent	Direct only	+ Premium	+ Bargaining ($\eta = 1$)
Diabetic CS	p_L better iff $(1 - s_m^{diab})s_{0d} > s_m^{diab}s_{md}$	p_L better iff $(1 - s_m^{diab})s_{0d} > s_m^{diab}[s_{md} - \rho_{p_L} + \rho_c]$	Conditional (positive for $c \downarrow$, negative for $p_L \downarrow$)
Non-diabetic CS	Indifferent	Unconditional, $p_L \downarrow$	Conditional (positive for $c \downarrow$, negative for $p_L \downarrow$)
Insurer	Unconditional, $p_L \downarrow$	Unchanged (premium channel = 0)	Conditional (positive for $c \downarrow$, negative for $p_L \downarrow$)
Manufacturer	Unconditional, $c \downarrow$	Conditional on insured-uninsured profitability Gap	Conditional on Gap and dr^*/dx

Table A6: Preferred Instrument by Agent: Direct, Premium, and Bargaining Channels ($\eta = 1$)

Manufacturer bargaining power. When we assume that $\eta = 0$, we cannot sign how the rebate changes with respect to the list price and copay. Let $\Delta s_m^{diab} = s_m^{diab}(r^*) - s_m^{diab}(0)$ denote the difference in insurance demand when the rebate is r^* compared to none. Then the changes in rebate can be written as:

$$\frac{dr^*}{dc} = - \frac{s_{md}\Delta s_m^{diab} - \frac{\partial s_{md}}{\partial c} [s_m^{diab}(r^*)(p_L(1 - r^*) - c) - s_m^{diab}(0)(p_L - c)]}{s_m^{diab}(r^*)p_L s_{md}}$$

$$\frac{dr^*}{dp_L} = \frac{\Delta s_m^{diab} - r^* s_m^{diab}(r^*)}{s_m^{diab}(r^*)p_L}$$

The derivatives can be signed through:

$$\frac{dr^*}{dc} > 0 \iff \underbrace{\left| \frac{\partial s_{md}}{\partial c} \right| \cdot p_L r^* s_m^{diab}(r^*)}_{\text{copay-elasticity}} > \underbrace{\Delta s_m^{diab} \left[s_{md} + \left| \frac{\partial s_{md}}{\partial c} \right| (p_L - c) \right]}_{\text{enrollment}}$$

$$\frac{dr^*}{dp_L} > 0 \iff \Delta s_m^{diab} > r^* s_m^{diab}(r^*)$$

Therefore, $\frac{dr^*}{dc} > 0$ when the change in insured drug spending is large, and the rebate does not drive enrollment on its own (such as a chronic, cost-sensitive drug where coverage is not

the main reason people enroll). It is negative when drug demand is relatively insensitive to copay, and the rebate has a larger effect on enrollment (such as a drug where patients fill regardless of modest copay changes). For a change in list price, $\frac{dr^*}{dp_L} > 0$ if the rebate-induced enrollment change is larger than the rebate rate times enrollment (i.e., the rebate has a large enough impact on enrollment). Compared to the case where $\eta = 1$, the optimal policy depends on a larger set of assumptions.

B.4 Additional Results for the Application

Table A7: Sensitivity Analysis

Specification	Baseline			Copay from \$30.90 to \$0						
	Net price	ω_D (%)	Δk at \$200 list	Fills (%)	Premium (\$/mo)	User (\$/yr)	Non-user (\$/yr)	Insurer (\$/yr)	Mfr. (\$/yr)	Total (\$/yr)
Baseline	33.98	0.1	0.00	10.0	0.01	217	-0.08	-5.15	-5.15	0.49
Aggregate OOP elasticity 0.05	34.02	0.0	0.00	5.0	0.00	213	0.00	-5.19	-5.19	0.26
Aggregate OOP elasticity 0.16	33.60	0.5	0.00	17.3	0.10	219	-0.67	-4.84	-4.84	0.63
Premium pass-through 0.13	21.10	0.0	0.00	9.8	0.00	218	0.00	-5.19	-5.19	0.51
Premium pass-through 0.74	42.95	1.2	0.00	12.4	0.33	206	-1.16	-4.61	-4.61	-0.02
Insurer bargaining weight 0.2	54.35	0.1	0.00	10.0	0.01	217	-0.06	-2.06	-8.24	0.51
Insurer bargaining weight 0.8	13.59	0.1	0.00	10.0	0.02	217	-0.10	-8.24	-2.06	0.47
Insulin-user share 0.02	34.37	0.0	0.00	10.1	0.01	217	-0.04	-2.06	-2.06	0.20
Insulin-user share 0.10	33.28	0.1	0.00	10.0	0.02	217	-0.11	-10.33	-10.33	0.99
Coverage value \$25/month	28.85	3.4	0.00	24.3	0.65	179	-4.21	-2.55	-2.54	-0.16
Marginal cost \$5 per fill	36.48	0.1	0.00	10.0	0.01	217	-0.08	-5.23	-5.23	0.32
Cash market, elasticity 0.5	45.69	0.2	-7.02	10.6	0.04	216	-0.28	-5.06	-5.06	0.40
Cash market, elasticity 1.5	45.81	0.1	-1.99	10.1	0.02	217	-0.12	-5.14	-5.14	0.47
Net price benchmarked to a 70% rebate	199.35	0.1	0.00	10.0	0.00	218	0.02	-5.15	-5.15	0.60

Notes: Each row re-calibrates (λ, g) to a \$48 premium and the stated pass-through (0.45 unless noted). Δk at \$200 list is the change in the bargained net price when the list price is cut to \$200. Insurer, manufacturer and total are per beneficiary-year.

Table A8: Counterfactual Copays

Copay	Net		Fills	Δ Consumer surplus			Δ per beneficiary-year			
	price (\$)	Rebate (%)	Premium (\$/mo)	per user (/mo)	User (\$/yr)	Non-user (\$/yr)	All (\$/yr)	Insurer (\$)	Mfr. (\$)	Total (\$)
\$30.90 (baseline)	33.98	94.9	48.00	0.558	0.0	0.00	0.00	0.00	0.00	0.00
\$25	30.69	95.4	48.00	0.569	39.9	-0.02	1.97	-0.90	-0.90	0.17
\$20	27.92	95.8	48.01	0.578	74.3	-0.04	3.68	-1.69	-1.69	0.29
\$10	22.40	96.6	48.01	0.596	144.7	-0.06	7.18	-3.37	-3.37	0.44
\$0	16.91	97.5	48.01	0.614	217.3	-0.08	10.79	-5.15	-5.15	0.49

Notes: List price fixed at \$664.50. Net price and premium are equilibrium outcomes. Fills per user include enrollment. Changes are relative to the baseline copay of \$30.90.

Cash markets and the outside option. Figure A8 traces the bargained net price against a net price ceiling and against the list price. The ceiling leaves the outside option unchanged,



Figure A8: Bargained Net Price under List-Price Cuts and Net Price Ceilings

Notes: Copay fixed at \$30.90. The dotted diagonal is the 45-degree line. Cash-market specifications are recalibrated to the same premium and pass-through targets. Without a cash market the net price is flat in the list price until the list price falls below the bargained net price (Proposition 3). With a cash market the list price enters the manufacturer's outside option and the value of going uninsured, so the net price varies with it everywhere: it rises throughout when cash demand is inelastic, and peaks near \$450–\$500 when cash demand is elastic at the list price, where cash revenue is highest. A net price ceiling leaves the cash price unchanged and so is flat above the bargained price (Proposition 2).

so the net price is flat above the bargained price and falls one for one below it; a list-price cut behaves the same way only without a cash market. With inelastic cash demand ($\epsilon_0 = 0.5$) a lower list price weakens the outside option and the net price falls throughout; with elastic cash demand ($\epsilon_0 = 1.5$) the net price *rises* from \$45.81 to \$46.84 when the list price is cut to \$500, as Proposition 4 predicts, and falls only once cash demand turns inelastic below about \$450. With η near one the numerical solution reproduces the proposition's closed form (\$23.78 versus \$23.73).

Table A9: Decomposition into Direct, Premium, and Bargaining Channels

	Direct	Premium	Bargaining	Total
<i>A. Copay cut from \$30.90 to \$0</i>				
Net price (\$/fill)	0.00	0.00	-17.07	-17.07
Premium (\$/month)	0.00	0.01	0.00	0.01
Insulin-user surplus (\$/user-year)	217.48	-0.16	0.01	217.33
Non-user surplus (\$/non-user-year)	0.00	-0.09	0.01	-0.08
Insurer profit	-11.44	0.00	6.29	-5.15
Manufacturer profit	1.14	0.00	-6.29	-5.15
Total surplus	0.58	-0.09	0.01	0.49
<i>B. Net price ceiling at 75% of the bargained net price</i>				
Net price (\$/fill)	-8.49	0.00	0.00	-8.49
Premium (\$/month)	0.00	0.00	0.00	0.00
Insulin-user surplus (\$/user-year)	0.00	0.02	0.00	0.02
Non-user surplus (\$/non-user-year)	0.00	0.01	0.00	0.01
Insurer profit	2.85	0.00	0.00	2.85
Manufacturer profit	-2.85	0.00	0.00	-2.85
Total surplus	0.00	0.01	0.00	0.01
<i>C. List-price cut to \$200, no cash market</i>				
Net price (\$/fill)	-23.75	0.00	23.75	0.00
Premium (\$/month)	0.00	0.00	0.00	0.00
Insulin-user surplus (\$/user-year)	0.00	0.05	-0.05	0.00
Non-user surplus (\$/non-user-year)	0.00	0.03	-0.03	0.00
Insurer profit	7.96	0.00	-7.96	0.00
Manufacturer profit	-7.96	0.00	7.96	0.00
Total surplus	0.00	0.03	-0.03	0.00

Notes: Direct: new policy, with the baseline rebate rate and premium (for Panel B, the net price set at the ceiling). Premium: premium re-optimized at the baseline rebate rate. Bargaining: rebate renegotiated. Insurer, manufacturer and total surplus are per beneficiary-year.

Table A9 decomposes three policies into the channels of equation (8). For the copay cut, the direct channel costs the insurer \$11.44 per beneficiary-year, the premium channel is negligible, and the bargaining channel returns \$6.29 by lowering the net price. A ceiling at 75% of the bargained price operates entirely through the direct channel. A list-price cut to \$200 without a

cash market shows neutrality channel by channel: holding the rebate *rate* fixed would transfer \$7.96 per beneficiary-year to the insurer, and renegotiation undoes all of it.

B.5 Insurance Demand Estimates

This appendix reports estimates of plan choice, which can discipline the premium sensitivity λ and the value of insulin coverage in Section 6 directly. Because the estimates are unstable across specifications, with the coefficients on insulin coverage and on premiums varying in sign, the paper calibrates these parameters to the premium and to external pass-through estimates instead; we report the baseline specification.

Sample. We filter to non-subsidized individuals enrolled in stand-alone Part D plans or not in any drug prescription plans in January 2022. We exclude individuals enrolled in Medicare Advantage plans.

The ex-ante value of insurance j 's coverage of insulin for patients in demographic group g using length of action l as

$$W_{gjl} = \ln \left(1 + \sum_{j \in J_l} \exp(\delta_{jgt}) \right)$$

where $l = 0$ indicates someone who is not diabetic (no insulin usage in a given year). We then create a singular expected value of insulin coverage for each plan by weighing W_{glt} using the annual share of individuals in each LOA group.

Patients choose insurance plan depending on the plan's premiums and drug coverage (with county and insurer FEs):

$$\begin{aligned} v_{jlt} &= \underbrace{\beta_g W_{jl}}_{\text{value from insulin coverage}} + \underbrace{\beta_{jl}}_{\text{other ins value}} - \underbrace{\phi_{jt}}_{\text{premium disutility}} + \eta_{jgl} \\ &= \delta_{jgl} + \eta_{jgl} \end{aligned}$$

The outside option is no insurance, and we assume patients without insurance pay the list price:

$$v_{0gl} = \beta_g W_{0gl} + \eta_{0gl}$$

The group and length of action specific market share for insurance m is thus

$$s_{jgl} = \frac{\exp(\delta_{jgl})}{\sum_{j' \in \{0, J\}} \exp(\delta_{j'gl})}$$

We exclude EWGP and PACE plans. To construct patient OOP cost for each drug, we used the pre-ICL 3 month estimates. For plans that did not report a pre-ICL 3 month copay or coinsurance, we assumed a standard 25% coinsurance.⁴

Table A10 shows the baseline estimates for insurance demand. Plan characteristics include deductible, formulary, and reduced cost sharing. Specifications with demographic heterogeneity, and specifications instrumenting premiums with the average ΔW and deductible of other plans in the same region, yielded coefficients of varying sign on insulin coverage and on premiums, which is why we do not use them.

Table A10: Insurance Demand Estimates (No Heterogeneity)

	(1)
Insulin coverage (ΔW_{jgl})	0.020* (0.009)
Premium (00s)(ϕ_{jt})	-0.021*** (0.004)
Implied WTP for Mean Plan (Quarter)	75
Observations	2,298
Plan Characteristics	Y
R^2	0.26

C Additional Data Description

This appendix collects the remaining descriptive exhibits for the 2022 Part D sample of Section 6: beneficiary characteristics, the medication classes used to identify likely diabetics, insulin fill types and plan characteristics, and the distributions of insulin coverage, cost sharing, and formulary placement across stand-alone plans.

⁴This was imputed for 93,073 (out of 149,648) drug-insurance pairs.

Table A11: Beneficiaries Summary Statistics

Characteristic	All	Part D Only
Share	1	0.79
Age	72	72
Female	0.54	0.57
Race/Ethnicity		
White	0.78	0.78
Black	0.11	0.11
Hispanic	0.03	0.04
Other	0.08	0.08
Share with any fill	0.15	0.19
Share with potential insulin fill	0.04	0.05
Share with insulin fill	0.01	0.01

Table A12: Medication Classes Used to Identify Diabetes-Related Pharmacotherapy in Medicare Part D Claims (2022)

Primary Clinical Use	Included Search Words
Insulin therapy (Type 1 and type 2 diabetes)	insulin, aspart, lispro, glulisine, glargine, detemir, degludec, isophane
Oral and non-insulin injectable glucose-lowering agents (type 2 diabetes)	glipizide, glimepiride, glyburide, sitagliptin, linagliptin, saxagliptin, alogliptin, janumet, tradjenta, repaglinide, nateglinide, pioglitazone, rosiglitazone, acarbose, miglitol, pramlintide
GLP-1 receptor agonists and dual incretin agents (type 2 diabetes; weight management)	lixisenatide, liraglutide, semaglutide, dulaglutide, exenatide, rybelsus, tirzepatide, mounjaro
Biguanide (type 2 diabetes; prediabetes; insulin resistance)	metformin

Table A13: Insulin Fill Summary Statistics (Type)

Characteristic	Share of Patient-Months
Observed insulin fill	0.56
Type of insulin	
Pen only	0.43
Vial only	0.09
Both	0.03
Length of action	
Rapid only	0.09
Short only	0.01
Intermediate only	0.03
Long only	0.26
Multiple	0.10

Table A14: Part D Plans Summary Statistics

Characteristic	Average	25th	75th
Standalone Part D Plans per Region	20	1	27
Premium (\$, Monthly)	48	6	207
Deductible	369	0	480

Figure A9: Average Drug Coverage by PDP

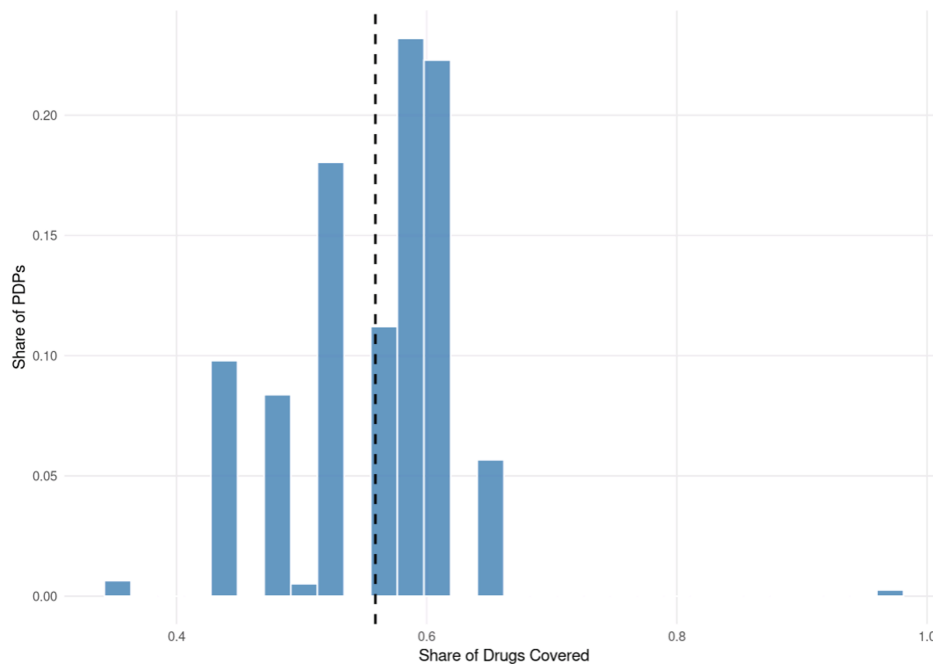


Figure A10: Average Patient Cost-Sharing by PDP

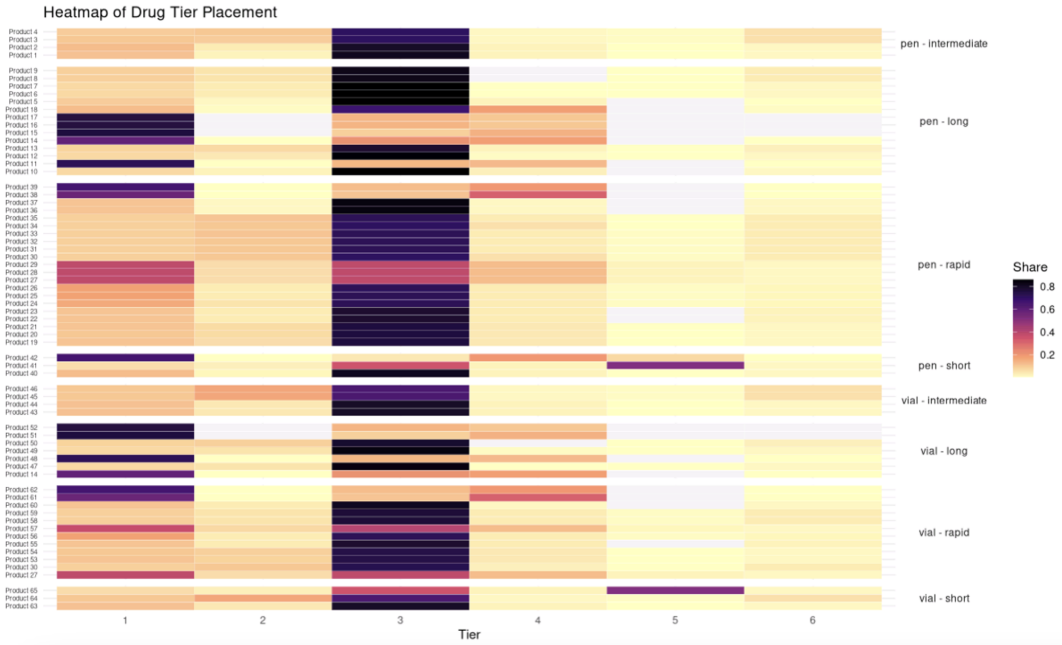
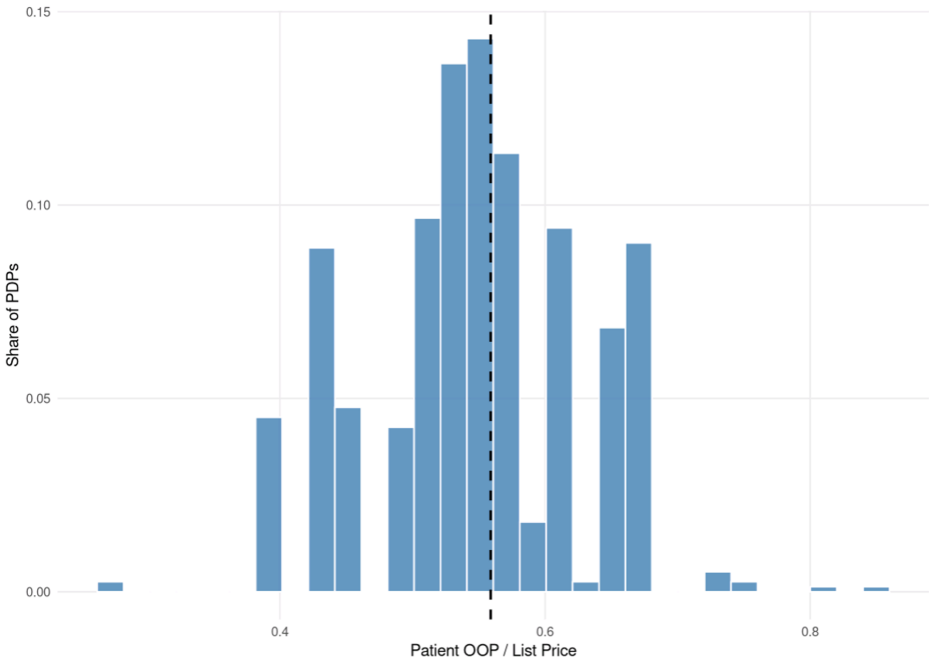


Figure A11: Distribution of Formulary Placement

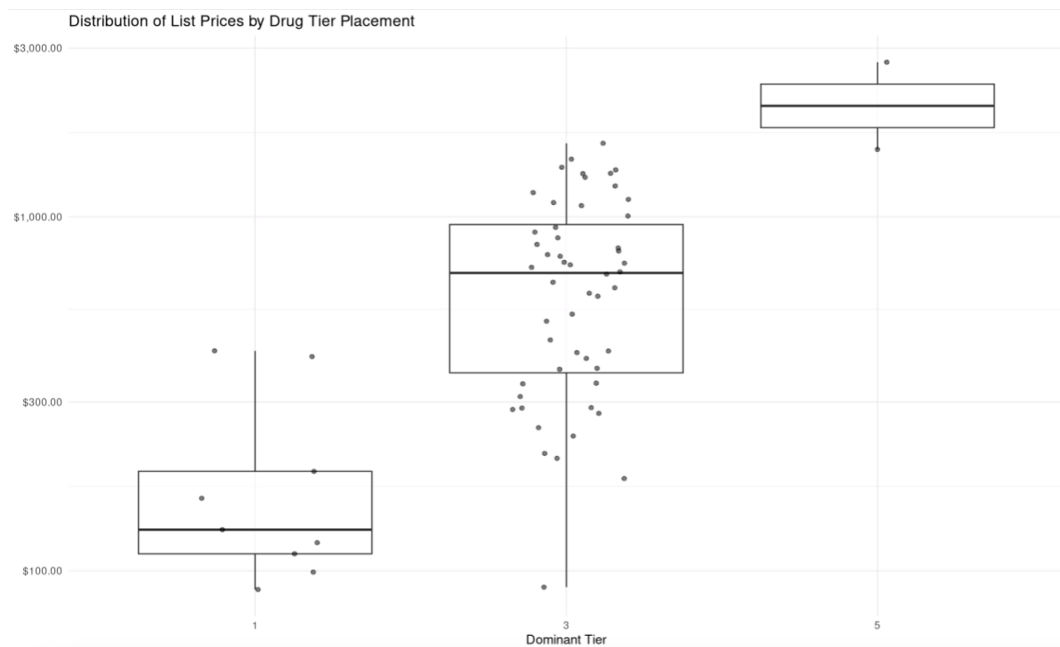


Figure A12: Distribution of List Prices by Dominant Drug Formulary Tier

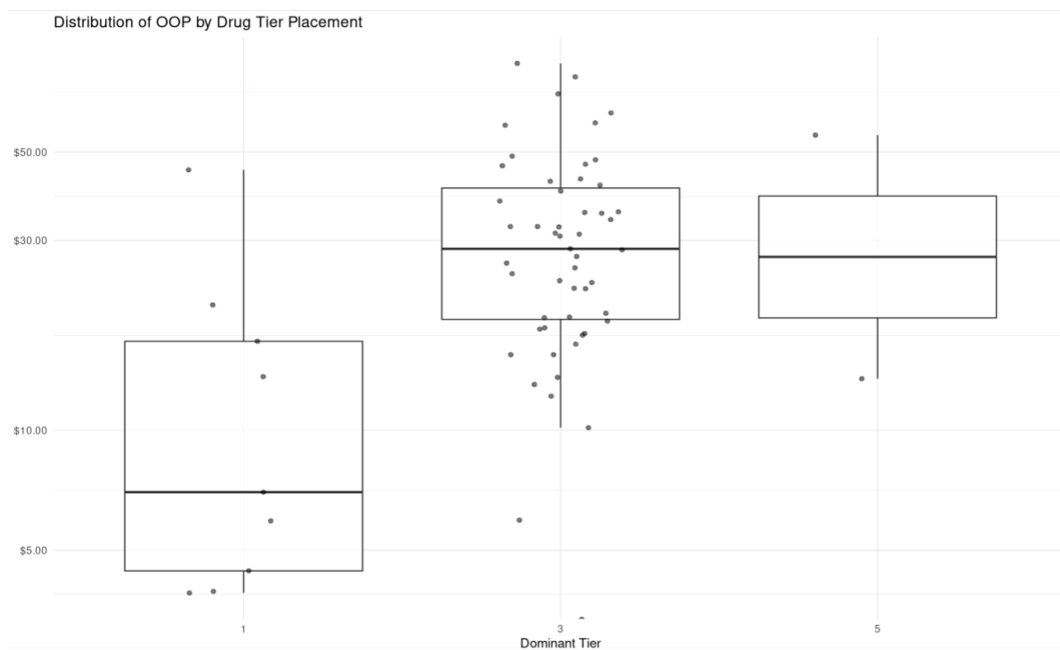


Figure A13: Distribution of Out-of-Pocket Prices by Dominant Drug Formulary Tier