Regulating Trade Margins and Consumer Welfare: Evidence from Cardiac Products in India*

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Abstract

Pharmaceutical manufacturers in India rely on distributors and retailers who impose high trade margins, resulting in elevated drug prices. To address this, the Indian government has introduced regulations capping these margins. This paper examines the impact of these caps on drug prices, access, and consumer welfare. We estimate a structural model of the Indian pharmaceutical industry, focusing on cardiac products, incorporating both the demand and supply sides of the market and the bargaining process between manufacturers and distributors. Our findings reveal that while a cap on trade margin reduces drug prices on average, the pass-through is incomplete, leading to heterogeneous effects—some prices decrease, while others may rise. Although consumer welfare improves, it falls short of the policy's intended objectives.

1 Introduction

Access to drugs is a contentious issue in developing and underdeveloped countries, where individuals often lack insurance coverage and must pay for pharmaceutical products out of pocket. This financial burden limits access to necessary medications, prompting governments to intervene through various policy measures. These interventions often include price controls (Dubois and Lasio (2018), Mohapatra and Chatterjee (2020)), trade margin regulations, public procurement of drugs (Dubois, Lefouili, and Straub (2021b), Callejas and Mohapatra (2021)), parallel imports (Dubois and Sæthre (2020)), reference pricing (Dubois, Gandhi, and Vasserman (2021a), Maini and Pammolli (2020)), and compulsory licensing (Chaudhuri, Goldberg, and Jia (2006),

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Moser and Voena (2012)), among others. Each of these policies aims to make medicines more affordable and accessible, yet their effectiveness varies across different market conditions. Understanding the impact of such regulations on drug prices, availability, and overall consumer welfare is essential for shaping effective healthcare policies.

This paper examines a similar policy in the Indian context, focusing on statins, which are widely used to treat cardiovascular diseases (CVDs) (Choudhry et al. (2014)). CVDs are the leading cause of death and disability worldwide, accounting for nearly one-third of all deaths in 2017 (Kalra et al. (2023)). Among less developed nations, India bears the highest burden, with 12% of all cases. Elevated cholesterol remains a major modifiable risk factor for CVD, and statins serve as the primary medication for cholesterol control. They are used for both primary and secondary prevention, playing a crucial role in reducing the risk of cardiovascular events.

The Indian pharmaceutical market for statins includes both branded drug producers and multiple generic manufacturers. Two key data patterns characterize this market. First, an average of 176 different stock-keeping units (SKUs) are sold across various regional markets in India, where each market is defined by a region-quarter combination. Second, despite the large number of available products, significant price dispersion exists within each molecule. After adjusting for defined daily dosage content, the ratio between the highest and lowest priced SKUs for a given molecule averages 6.5, indicating substantial price variation. This high degree of price dispersion among generic products is partly driven by differences in the trade margins set by distributors. In India, manufacturers rely on distributors and retailers, who add substantial markups, typically ranging from 35% to 40% of the final price. These large variations in trade margins contribute significantly to the high prices observed in the market. As a result, even within the same molecule, consumers face considerable price differences, highlighting the role of distribution costs in shaping pharmaceutical pricing.

In response to these pricing concerns, the Indian government plans to impose caps on trade margins. One proposal suggests reducing the trade margin and capping it at 15%. In theory, such a cap could lower drug prices, but this reduction depends on whether the full extent of the margin cut is passed on to consumers. However, actual price changes will also be influenced by factors such as demand elasticities and the bargaining power between manufacturers and retailers. Under a scenario where trade margin caps are enforced, manufacturers may adjust their pricing strategies, leading to different market outcomes.

To assess the impact of trade margin rationalization on drug prices, access, and consumer welfare, we develop and estimate a structural model of the statins market in India. On the demand side, we employ a Berry, Levinsohn, and Pakes (BLP) model (Berry, Levinsohn, and Pakes, 1995) to recover consumer preferences for various drug characteristics and compute price elasticities. On the supply side, our model incorporates the negotiations between manufacturers and distributors by using a bargaining framework. This approach allows us to estimate key parameters, including marginal costs and the bargaining power of manufacturers and retailers.

Our demand estimates indicate that consumers are highly price sensitive, though this sensitivity varies across individuals. Consumers also place value on newer drugs and different formulations available in the market. The average own-price elasticity for statins is approximately -7.2, suggesting significant price responsiveness. Our marginal cost estimates imply an average Lerner index of 23% for manufacturers, indicating that they charge a relatively low markup compared to retailers, who apply margins between 35% and 40%. Additionally, our estimated bargaining parameter is around 0.71, suggesting that distributors hold significantly greater bargaining power than manufacturers in price negotiations. These factors play a crucial role in shaping final drug prices in the Indian pharmaceutical market.

Using these estimates, we conduct a counterfactual analysis by imposing the proposed trade margin cap, limiting margins to 15%. Based on the estimated bargaining parameter and marginal costs, we recompute prices and quantities purchased under the new equilibrium. Our findings show that reducing trade margins from 35% to 15% leads to an average price reduction of 6.5%. However, the impact varies—while prices generally decrease, some may even rise depending on demand elasticity and bargaining power.

The policy also improves consumer welfare, which increases by 5% in the new equilibrium. However, if the policy had functioned as intended—fully passing the reduction in trade margins to consumers—consumer welfare would have increased by 14%. This discrepancy suggests that the policy's effectiveness was limited by the incomplete pass-through of cost reductions. In other words, while the regulation does lower drug prices and improve consumer welfare, it falls short of achieving the full benefits anticipated by the government. The findings highlight the complexities of market dynamics, where factors like manufacturer-retailer negotiations and demand elasticity influence how much of the margin reduction translates into actual consumer savings.

The paper is structured as follows. Section 2 provides an overview of the industry and a description of the available data. Section 3 outlines the price regulatory framework in India. Section 4 details the structural model, followed by Section 5, which presents the estimation results. Section 6 discusses the counterfactual analysis, and finally, Section 7 concludes the paper.

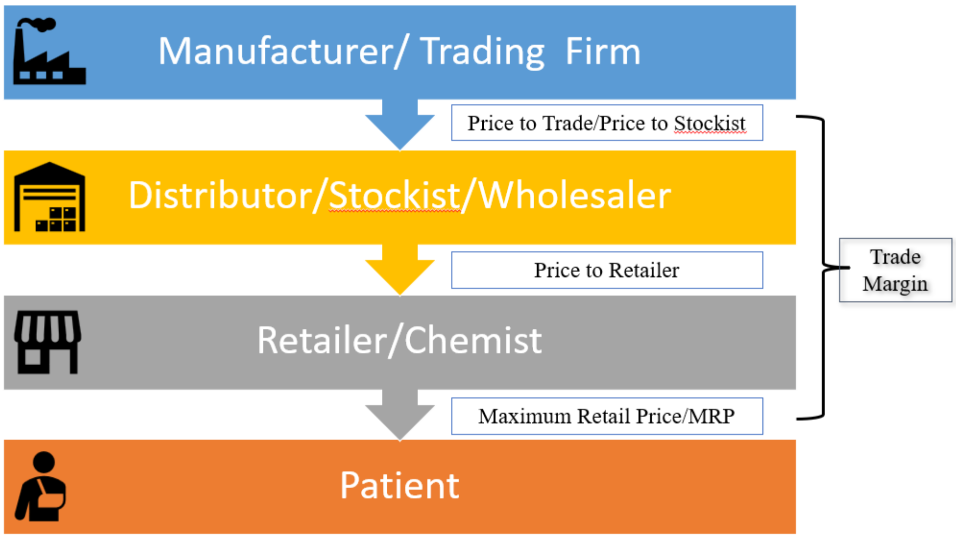
2 Industry and Data

2.1 Pharmaceutical supply chain in India

In India, the pharmaceutical supply chain consists of manufacturers, distributors, and retailers. Manufacturers operate regionally through designated warehouses, commonly known in the industry as carry-forward agents. These warehouses distribute drugs to retailers via stockists, who act as intermediaries between manufacturers and retailers, as well as institutions such as hospitals. As the figure 1 suggests, stockists ensure the availability of pharmaceutical products across different market segments. Consumers pay the Maximum Retail Price (MRP) for drugs, which includes various markups along the supply chain. The portion of the MRP received by manufacturers is referred to as the Price to Stockist (PTS), representing the price at which manufacturers sell their products to stockists before further distribution. We define the trade margin to be

$$\text{Trade Margin} = \frac{MRP - PTS}{MRP}$$

Figure 1: Pharma Supply Chain in India



2.2 Data Description

Our primary data comes from AIOCD Awacs Pvt. Ltd., the marketing research subsidiary of the All India Organization of Chemists and Druggists (AIOCD). Compared to IMS data, an alternative private source, AIOCD data is considered more accurate due to its better coverage and compliance in collecting sales and price information. This dataset is widely used by financial analysts and the Competition Commission of India for antitrust investigations.

Our dataset includes records of drug prices and sales for all medicines sold in India between January 2016 and December 2021. A key advantage of this data is that it captures not only the final price paid by consumers (the Maximum Retail Price or MRP) but also the Price to Stockist (PTS). This allows us to directly compute trade margins.

Additionally, the data is disaggregated at the regional level across 23 geographic markets defined by AIOCD. This finer level of geographic detail provides a distinct advantage over IMS data, as it enables us to examine regional variations in firms' pricing strategies and product offerings. By leveraging these regional differences, we can better understand the incentives driving manufacturers and distributors in different parts of India's pharmaceutical market.

We define a market as a region-quarter combination. Within each market, pharmaceutical products are available in multiple presentations, which vary by dosage form (e.g., tablets, injections), strength (e.g., 100 mg, 500 mg), and packet size (e.g., 50-tablet bottle, 100-tablet bottle). These different product presentations are referred to as stock-keeping units (SKUs). To ensure comparability across SKUs, we standardize each product by converting it into defined daily dosage (DDD) units based on the guidelines provided by the World Health Organization. This allows for a consistent measure of drug consumption across different formulations and packaging sizes.

Figure 2: Variations in MRP and PTS

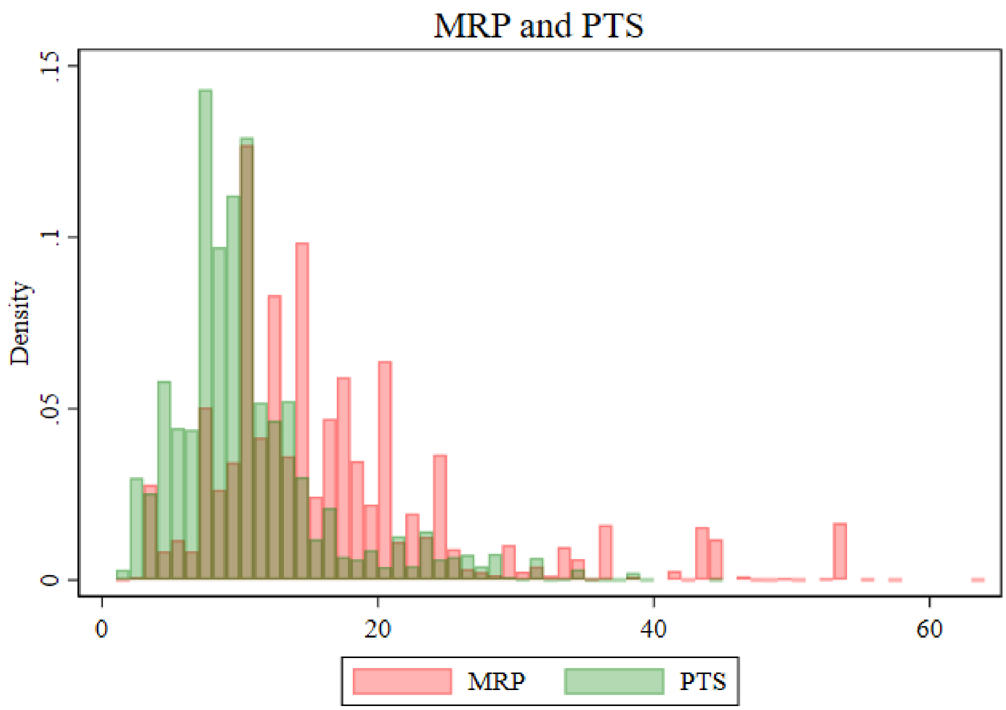


Figure 2 presents the distribution of Maximum Retail Price (MRP) and Price to Stockist (PTS) in the statin market. The data reveals significant variation in both MRP and PTS across different products. The difference between these two prices reflects the extent of trade margins observed in the market, highlighting the role of intermediaries in price determination.

3 Regulations to control price in India

4 Model

To assess the welfare implications of trade margin control policies, it is essential to model how firms adjust prices in response to changing market conditions. This section introduces a model that captures the bargaining process between manufacturers and distributors in setting product prices, as well as consumers' decision-making when selecting among available products.

4.1 Demand

The indirect utility of consumer i for drug j in market t be given by

$$u_{ijt} = \alpha_i p_{jt} + x_{jt}\beta_i + \xi_{jt} + \epsilon_{ijt}$$

If ϵ_{ijt} follows TIEV, then market share is given by

$$s_{jt}(\alpha, \beta, \theta) = \int \frac{\exp\left(\alpha_i p_{jt} + x_{jt}\beta_i + \xi_{jt}\right)}{1 + \sum_k \exp\left(\alpha_i p_{jt} + x_{kt}\beta_i + \xi_{kt}\right)} f\left(\alpha_i, \beta_i \mid \theta\right)$$

Each market is defined at the region-quarter level. We focus on the market for lipid-regulating medications, where the outside good includes all non-statin products and those with a market share of less than 0.5%.

4.2 Supply

Let us denote the set of regions where a firm f sells any product at time t by R_{ft}. For any region $r \in R_{ft}$, let us denote the set of products offered by firm f as J_{frt}. Each firm f bargains over the PTS price with the distributor. Since the trade margin for a product is exogenously determined, the retailer's trade margin remains fixed, making the Maximum Retail Price (MRP) directly proportional to the PTS price.

We model pricing using Nash bargaining, assuming that prices are determined as the solution to a Nash equilibrium (Horn and Wolinsky (1988), Collard-Wexler et al. (2019)). When a firm negotiates the Price to Stockist (PTS), denoted as p_{fjt}, the Nash surplus from setting prices p_{fjt} for all $j \in J_{ft}$ is defined as the difference between the profit under agreement and the profit in case of disagreement. Since the distributor association functions as a monopoly, we assume that if negotiations break down, the manufacturer is unable to sell any products to the distributor, resulting in zero profit. This suggests:

$$\Delta\pi_{ft} = \pi_{ft} - 0 = \sum_{r \in R_{ft}} \left(\sum_{j \in J_{frt}} (p_{fjt} - c_{fjt})\, q_{fjrt}(\bar{p}_{ft}) \right) \tag{4.1}$$

where c_{fjt} is the marginal cost of product j from firm f at t, $\bar{p}_{fjt} \equiv p_{fjt}/(1-\tau_{fjt})$ is the maximum retail price defined with the fixed trade margin τ_{fjt}, and $\bar{p}_{ft}$ is the vector of all prices $\bar{p}_{fjt}$.

On the distributor side, the Nash surplus is the difference between the selling of all products, including the ones of firm f, and the selling of only other products by other firms:

$$\Delta\Pi_{tf} = \Pi_t - \Pi_{t\setminus f}$$

where Π_t is the profit of the distributor in case of agreement and $\Pi_{t\setminus f}$ is the profit of the retailer in case of disagreement with f but agreement with others. Those profits are thus written as follows:

$$\Pi_t = \sum_r \sum_j p_{fjt} \frac{\tau_{fjt}}{1-\tau_{fjt}} q_{fjrt}(\bar{p}_{ft})$$

and

$$\Pi_{t\setminus f} = \sum_r \sum_{j \notin J_{frt}} p_{fjt} \frac{\tau_{fjt}}{1-\tau_{fjt}} q_{-fjrt}(\bar{p}_{-ft})$$

where $\bar{p}_{-ft}$ is the vector of all prices with firm f prices equal to $+\infty$ and $q_{-fjrt} = 0$ if $j \in J_{frt}$.

In a Nash-in-Nash equilibrium, each pair of bargaining between a firm and the distributor negotiates, taking as given the equilibrium prices negotiated by other pairs. Thus, the Nash-in-Nash equilibrium is the solution to the following maximization problem :

$$\max_{p_{fjt}, j \in J_{ft}} (\Delta\pi_{ft})^{\beta} (\Delta\Pi_t)^{(1-\beta)}$$

where $\beta \in (0,1)$ is the bargaining parameter of the firm.

The necessary first-order conditions are then given by:

$$\beta \frac{\partial \log \Delta\pi_{ft}}{\partial p_{fjt}} + (1-\beta) \frac{\partial \log \Delta\Pi_t}{\partial p_{fjt}} = 0$$

or

$$\beta \frac{1}{\Delta\pi_{ft}} \frac{\partial \Delta\pi_{ft}}{\partial p_{fjt}} + (1-\beta) \frac{1}{\Delta\Pi_t} \frac{\partial \Delta\Pi_t}{\partial p_{fjt}} = 0$$

where

$$\frac{\partial \Delta\pi_{ft}}{\partial p_{fjt}} = \sum_{r \in R_{ft}} \left(\sum_{j' \in J_{frt}} (p_{fj't} - c_{fj't}) \frac{\partial q_{fj'rt}(\bar{p}_{ft})}{\partial p_{fjt}} \right) + \sum_{r \in R_{ft}} q_{fjrt}$$

and

$$\frac{\partial \Delta\Pi_t}{\partial p_{fjt}} = \sum_r \frac{\tau_{fjt}}{1-\tau_{fjt}} q_{fjrt}(\bar{p}_{ft}) + \sum_r \sum_{j'} p_{fj't} \frac{\tau_{fj't}}{1-\tau_{fj't}} \frac{\partial q_{fj'rt}(\bar{p}_{ft})}{\partial p_{fjt}} - \sum_r \sum_{j' \notin J_{frt}} p_{fj't} \frac{\tau_{fj't}}{1-\tau_{fj't}} \frac{\partial q_{-fjrt}(\bar{p}_{-ft})}{\partial p_{fjt}}$$

As

$$\Delta\Pi_t = \sum_r \sum_j p_{fjt} \frac{\tau_{fjt}}{1-\tau_{fjt}} q_{fjrt}(\bar{p}_{ft}) - \sum_r \sum_{j' \notin J_{frt}} p_{fj't} \frac{\tau_{fj't}}{1-\tau_{fj't}} q_{-fj'rt}(\bar{p}_{-ft})$$

$$= \sum_r \sum_{j \in J_{frt}} p_{fjt} \frac{\tau_{fjt}}{1-\tau_{fjt}} q_{fjrt}(\bar{p}_{ft}) + \sum_r \sum_{j' \notin J_{frt}} p_{fj't} \frac{\tau_{fj't}}{1-\tau_{fj't}} (q_{-fj'rt}(\bar{p}_{-ft}) - q_{-fj'rt}(\bar{p}_{-ft}))$$

and thus the first order conditions can be written as

$$\frac{\partial \Delta\Pi_t}{\partial p_{fjt}} = \sum_r \frac{\tau_{fjt}}{1-\tau_{fjt}} q_{fjrt}(\bar{p}_{ft}) + \sum_r \sum_{j'} p_{fj't} \frac{\tau_{fj't}}{1-\tau_{fj't}} \frac{\partial q_{fj'rt}(\bar{p}_{ft})}{\partial p_{fjt}} - \sum_r \sum_{j' \notin J_{frt}} p_{fj't} \frac{\tau_{fj't}}{1-\tau_{fj't}} \frac{\partial q_{-fjrt}(\bar{p}_{-ft})}{\partial p_{fjt}}$$

the first order conditions write as

$$\frac{\partial \Delta\pi_{ft}}{\partial p_{fjt}} + \frac{1-\beta}{\beta} \frac{1}{\Delta\Pi_t} \frac{\partial \Delta\Pi_t}{\partial p_{fjt}} \Delta\pi_{ft} = 0$$

where $\Delta\pi_{ft}$ and $\frac{\partial \Delta\pi_{ft}}{\partial p_{fjt}}$ are linear in the unknown marginal costs c_{fjt} and $\Delta\Pi_t$ and $\frac{\partial \Delta\Pi_t}{\partial p_{fjt}}$ are known once the demand function is known. We thus obtain a system of linear equations in unknown marginal costs that we can invert for any given β.

Denoting $c_{fjt}(\beta)$ the solution, we need additional restrictions in order to identify the bargaining parameter. We use natural restrictions on marginal costs such as:

$$c_{fjt} = c_{fj} + c_t + \omega_{fjt}$$

where

$$E(\epsilon_{fjt}) = 0$$

5 Estimation Results

Our demand and marginal cost estimation follows Berry et al. (1995), Nevo (2000), and Collard-Wexler et al. (2019). We construct moments using demand equations and first-order conditions from profit maximization, estimating parameters through the Generalized Method of Moments (GMM). Since firms strategically set prices after the realization of unobserved demand and cost shocks (ξ, ω), prices in the demand model may be endogenous. We use BLP-style instruments and Gandhi-Houde-style instruments (Gandhi and Houde (2021)) to address the price endogeneity problem.

Tables 1 and 2 present the results from our demand and marginal cost estimations. As expected, consumers derive negative utility from price, indicating price sensitivity. Additionally, they place a higher value on newer drugs. Our demand estimates suggest an average own-price elasticity of -7.2, indicating that consumers are highly price elastic. The estimated bargaining parameter for manufacturers is 0.29, suggesting that distributors hold significantly greater bargaining power in price negotiations. Our marginal cost estimates imply an average Lerner index of 23% for manufacturers, indicating relatively moderate markups in comparison to distributors' margins.

Table 1: Results from Demand Estimation

Variables	Estimates
Price	-10.5***
	(1.1)
Price × Normal Draw	2.22***
	(0.87)
Constant × Normal Draw	2.25***
	(0.91)
SKU age × Normal Draw	2.67***
	(0.77)
Correlation parameter	0.94***
b/n Price and SKU age	(0.21)
Constant	1.17***
	(0.11)
SKU age	-2.31***
	(0.02)
Brand Dummy	Yes
Region-Time Dummy	Yes

Table 2: Results from Marginal Cost Estimation

Variables	Estimates
Bargaining parameter (β)	0.29*
	(0.17)
Constant	-1.27***
	(0.18)
SKU age	-0.05***
	(0.01)
Brand Dummy	Yes
Region-Time Dummy	Yes

6 Counterfactual Results

Using our estimates, we conduct a counterfactual analysis by capping the trade margin at 15%. We incorporate the estimated demand and marginal cost parameters, along with the unobserved demand and cost components (ξ and ω), into the counterfactual estimation. We then recompute the new price equilibrium and assess consumer welfare under these conditions.

However, the government's policy aimed for a more direct outcome—reducing drug prices by the full extent of the trade margin cut. This would only occur if the reduction in trade margins was entirely passed on to consumers. To evaluate this scenario, we compute the expected price reduction and consumer welfare under the assumption of complete pass-through, referring to this as the intended outcome. We then compare it to the actual equilibrium outcome, derived by solving the new pricing equilibrium under the trade margin cap. This comparison highlights the extent to which elasticities and bargaining power affect the pass-through of cost reductions.

Figure 3: Trade Margin Reduction Pass-through

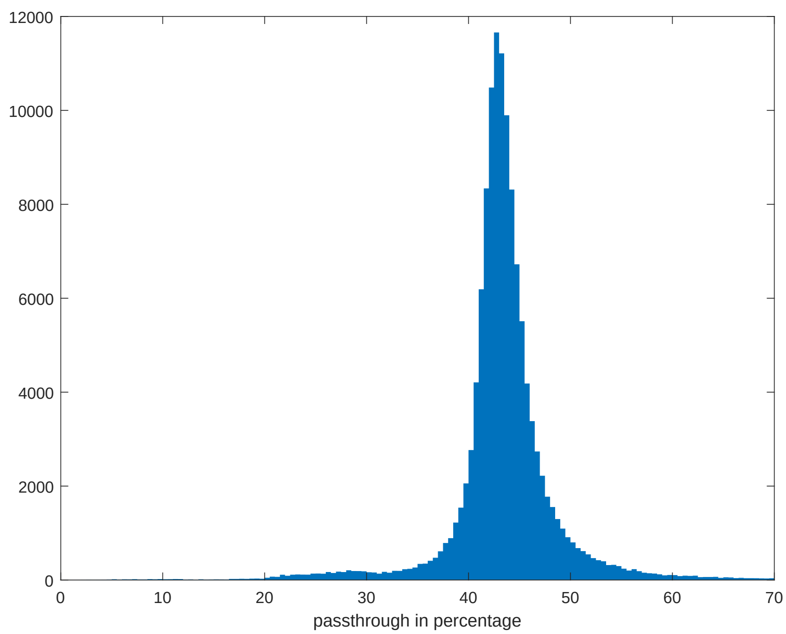


Figure 3 illustrates the extent to which trade margin reductions are passed on to consumers. On average, only 40% to 50% of the total reduction is reflected in consumer prices, indicating an incomplete pass-through. Consequently, the equilibrium prices decrease significantly less than the intended price reductions under the policy.

Figure 4: Change in Prices due to trade margin control

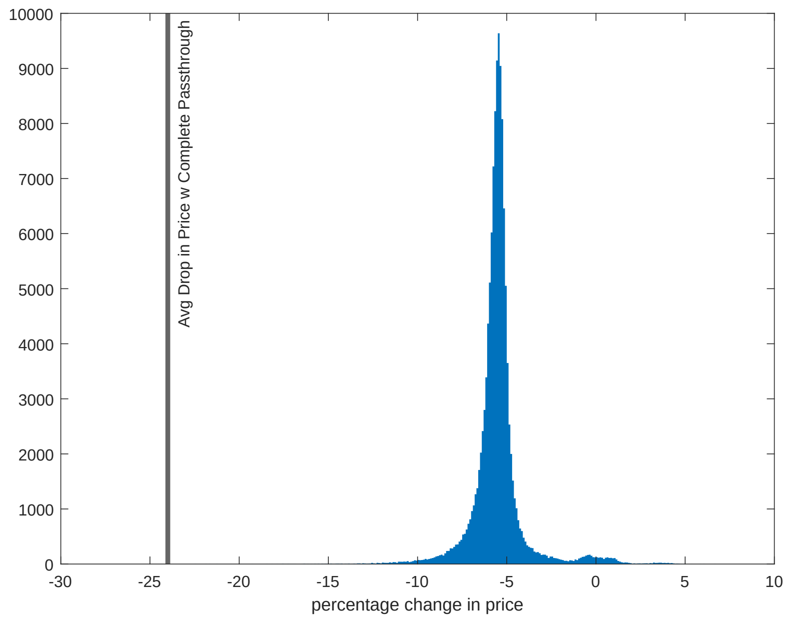


Figure 4 shows that trade margin rationalization leads to an average price reduction of 6.5%. However, if the policy had performed as intended, prices would have decreased by approximately 24%, resulting in a consumer welfare gain of 14%. In reality, the incomplete pass-through of trade margin reductions leads to a much smaller price drop, limiting the welfare gain to just 5%. This shortfall highlights the gap between the policy's intended effects and actual market outcomes, emphasizing the role of market forces and bargaining power in determining the extent of price reductions and consumer benefits.

7 Conclusion

This paper examines the impact of trade margin caps on drug prices, access, and consumer welfare in the Indian pharmaceutical market, focusing on statins. Given the significant price dispersion in the market, largely driven by high and varying trade margins set by distributors and retailers, government intervention through price regulation has the potential to influence market outcomes. Using a structural model that captures both demand and supply sides of the market, we estimate the effects of a proposed trade margin cap limiting margins to 15%.

Our analysis finds that while the policy leads to a reduction in drug prices, the extent of this reduction is limited. On average, prices decrease by 6.5%, but due to variations in demand elasticities and bargaining power, some prices may even increase. This incomplete pass-through of cost reductions suggests that manufacturers adjust their pricing strategies in response to the regulation, preventing the full benefits of the margin cap from reaching consumers.

Furthermore, our findings indicate that consumer welfare increases by 5% under the new equilibrium. However, if the policy had functioned as intended—where the entire reduction in trade margins was reflected in lower prices—consumer welfare would have increased by 14%. This gap highlights the challenges in regulating pharmaceutical markets, where multiple intermediaries influence final prices. The strong bargaining power of distributors, as reflected in our estimated parameter of 0.71, plays a crucial role in limiting the policy's effectiveness.

Overall, while trade margin rationalization is a step toward making medicines more affordable, its success depends on how effectively cost reductions are transmitted to consumers. Understanding these dynamics is crucial for designing policies that balance affordability, market sustainability, and consumer welfare.

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