INTERNATIONAL JOURNAL OF ECONOMIC SOCIAL SCIENCE AND MANAGEMENT LAW
Peer Reviewed, Referred & Indexed Journal
E-ISSN : 3070-0558
VOL.7, NO.4 (2026)

THE HIDDEN CASCADING COST OF DIGITAL PAYMENTS

An Economic Analysis of Merchant Discount Rate (MDR) Across India's Supply Chain

Dr. Ashish Patni and Dr. Prapti Chopra

AP GLOBAL | India Conceptual economic modelling paper Policy review cut-off

Abstract

This paper examines whether a small merchant discount rate (MDR), when applied to successive eligible person-to-merchant (P2M) transactions, can create a cumulative cost effect as goods move through a multi-stage supply chain. A deterministic model is developed using an initial manufacturing cost of ₹10,000, five successive 5% cost mark-ups and an assumed MDR of 0.4% at each eligible stage. Under full pass-through, the modelled final value increases from
₹12,762.82 in the zero-MDR counterfactual to ₹13,020.12, a difference of ₹257.31 (approximately 2.02%). Direct MDR across the five stages is ₹234.03; the remaining ₹23.27 is the additional downstream mark-up effect on MDR previously embedded in landed cost.

A second sensitivity case removes MDR from the fifth transaction while retaining it on the first four stages. This produces a modelled final value of ₹12,968.25, or ₹205.43 above the zero-MDR counterfactual. However, this second case is only a valid below-₹2,000 policy illustration if the actual fifth-stage payment is independently below ₹2,000. In the same single-product chain model, the fifth-stage transaction value is approximately ₹12,968.25 and therefore does not satisfy that threshold. The paper explicitly distinguishes this mathematical sensitivity from a claim about actual eligibility under the announced framework.

The study is conceptual rather than empirical. It demonstrates a conditional cost-transmission mechanism and identifies the transaction-level data needed to estimate real-world incidence. It does not claim that MDR inevitably causes retail inflation or that every UPI payment attracts MDR.

Keywords: Merchant Discount Rate; UPI; P2M payments; supply-chain economics; cost pass-through; payment economics; India.

1. Introduction

UPI has become an important part of India's retail payment infrastructure. Digital payments can reduce cash handling and improve transaction traceability, while payment acceptance also involves infrastructure, technology, compliance and risk-management costs. MDR is a merchant-side fee associated with processing certain payment transactions.

When goods pass through several independent businesses, each sale may create a separate payment event. If an eligible transaction fee is absorbed into the next buyer's landed cost, and the next seller applies a percentage mark-up to that cost, the earlier fee can influence later transaction values. The resulting effect depends on eligibility, transaction size, pass-through behaviour, merchant classification and the structure of the supply chain.

This paper isolates that mechanism through a transparent five-stage model. The purpose is not to assert that the illustrative rate applies to every UPI transaction, but to examine the arithmetic consequences if it applies at each assumed eligible stage.

2. Research Question, Hypotheses and Objectives

Research question: Under full cost pass-through, how does repeated MDR on successive eligible merchant transactions affect the cumulative value of a product moving through a five-stage supply

chain?

H1: Holding stage count, mark-up and pass-through constant, a positive MDR at each eligible stage increases the modelled final value relative to a zero-MDR counterfactual.

H0: Under the specified deterministic model, applying MDR at each eligible stage does not increase the modelled final value.

Objectives: (i) calculate stage-wise MDR; (ii) compare zero-MDR and positive-MDR cases; (iii) isolate direct MDR from the downstream mark-up effect; (iv) test sensitivity to alternative assumed rates; and (v) identify the limits of applying the model to actual policy rules.

3. Regulatory Context and Chronology

The regulatory framework must be distinguished from the paper's simplified model. The Ministry of Finance stated on 18 April 2025 that MDR had been removed from specified UPI P2M transactions effective January 2020, following the Gazette notification dated 30 December 2019 [1]. On 15 September 2026, the Ministry of Finance published an explanatory framework stating that P2P transactions remain free, P2M transactions up to ₹2,000 remain free, specified small merchants remain under zero-MDR treatment, and a 0.4% MDR applies only to specified eligible merchant transactions above ₹2,000, subject to sector-specific rates and caps [2].

The 15 September 2026 PIB release states a ₹300 cap for transactions of ₹75,000 and above and identifies separate treatment for specified essential/thin-margin sectors and capital-market transactions [2]. NPCI subsequently deferred the planned 15 October 2026 implementation until after Diwali, with a revised date to be notified separately [3].

Therefore, as at the manuscript cut-off of 30 October 2026, the paper should describe the framework as announced but deferred, not as an already implemented charge.

Date	Documented development	Relevance to this study
30 Dec 2019	Gazette notification referred to by the Ministry of Finance [1]	Basis for removal of MDR on specified UPI P2M transactions from January 2020.
Jan 2020	Zero-MDR treatment effective for specified UPI P2M transactions [1]	Historical zero-MDR baseline.
18 Apr 2025	PIB clarification on UPI charges and zero-MDR position at that time [1]	Confirms policy position as of that announcement; not a statement about later proposals.
15 Sep 2026	Ministry of Finance explanatory release on selective MDR [2]	Announced scope, thresholds, rates and exemptions.
13 Oct 2026	NPCI deferred planned 15 Oct rollout until after Diwali; new date to be notified [3]	Implementation timing was postponed.
30 Oct 2026	Research cut-off used in this manuscript	No claim is made here that the deferred framework had

		commenced by this cut-off.

The 2026 policy release is attributed to the Ministry of Finance and NPCI's implementation communication. The manuscript does not attribute the detailed operational rule to an individual minister. Any ministerial quotation should be included only if the exact speech or official transcript is obtained and cited.

4. Conceptual Supply-Chain Model

The model represents five successive merchant sales: manufacturer to wholesaler; wholesaler to regional distributor; regional distributor to state distributor; state distributor to retailer; and retailer to consumer. Each stage adds a 5% mark-up to the preceding landed cost. The assumed MDR is 0.4% of that stage's transaction value, and the fee is fully passed into the next stage's cost base.

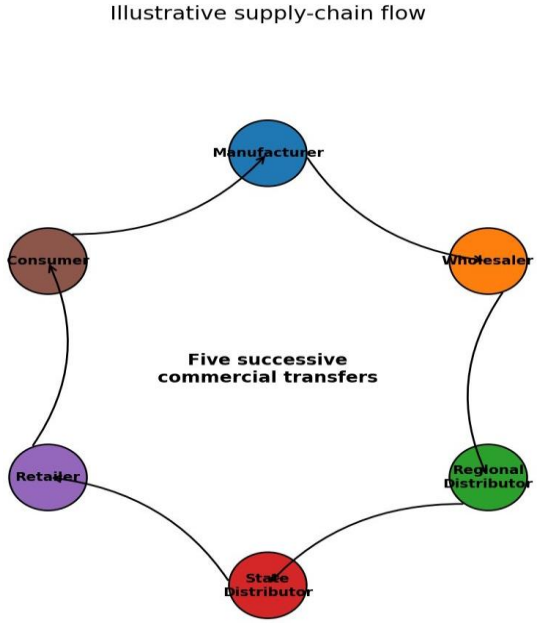


Figure 1. Illustrative sequence of five commercial transfers between six supply-chain participants.

5. Methodology and Mathematical Specification

Let C_0 be the initial manufacturing cost, m the mark-up rate per stage, r the MDR rate and n the number of MDR-bearing stages. At stage i, the transaction value is $T_i = C_{i-1}(1+m)$, the MDR fee is $F_i = rT_i$, and the next landed cost is C_i

$= T_i + F_i$. Under constant rates and full pass-through, $C_n = C_0[(1+m)(1+r)]^n$. The zero-MDR counterfactual is $C_n^0 = C_0(1+m)^n$.

The total final-value difference is $\Delta C_n = C_n - C_n^0$. This difference is not identical to the sum of direct MDR fees, because subsequent mark-ups are applied to earlier MDR amounts embedded in landed cost.

Base assumptions: C_0 = ₹10,000; m = 5%; r = 0.4%; n = 5; all five transactions are assumed eligible for the illustrative calculation; and the merchant passes the entire MDR into the next stage. The model excludes credit terms, discounts, logistics, taxes on payment services, fixed fees, inventory losses and changes in demand.

6. Base-Case Results: MDR at All Five Stages

Stage	Transaction	Transaction value (₹)	MDR 0.4% (₹)	Landed cost after MDR (₹)
1	Manufacturer → Wholesaler	10,500.00	42.00	10,542.00
2	Wholesaler → Regional distributor	11,069.10	44.28	11,113.38
3	Regional → State distributor	11,669.05	46.68	11,715.72
4	State distributor → Retailer	12,301.51	49.21	12,350.71
5	Retailer → Consumer	12,968.25	51.87	13,020.12

Measure	Zero MDR	0.4% MDR at five stages
Final modelled value	₹12,762.82	₹13,020.12
Direct MDR total	₹0.00	₹234.03
Total increase over zero-MDR case	—	₹257.31
Relative increase	—	2.02%
Additional downstream mark-up effect	—	₹23.27

The full five-stage model produces a final value of ₹13,020.12. The zero-MDR counterfactual is ₹12,762.82. The total difference is ₹257.31. Direct MDR sums to ₹234.03, while approximately ₹23.27 is attributable to the effect of applying later 5% mark-ups to earlier MDR embedded in cost.

7. Alternative Sensitivity Case: No MDR on the Fifth Stage

For comparison, the model can remove MDR from the fifth transaction while retaining MDR on the first four stages. The retailer then applies the fifth 5% mark-up but no MDR is added to that final transaction. The resulting modelled final value is ₹12,968.25. This is ₹205.43 (1.61%) above the zero-MDR counterfactual; direct MDR across the first four stages is ₹182.16.

Scenario	MDR-bearing stages	Final-stage MDR treatment	Final modelled value	Increase vs zero MDR
A. MDR at all five stages	5	Included	₹13,020.12	₹257.31 (2.02%)
B. MDR at first four stages only	4	Excluded	₹12,968.25	₹205.43 (1.61%)
C. Zero-	0	Excluded	₹12,762.82	Baseline

MDR counterfactual				

Critical threshold qualification: the fifth-stage transaction value in Scenario B is ₹12,968.25. It is therefore not below
₹2,000. Consequently, Scenario B must be described as a mathematical sensitivity case in which the fifth-stage fee is switched off, not as proof that the final transaction qualifies for the announced below-₹2,000 exemption. To model a genuine below-₹2,000 consumer payment, the actual final payment amount and the relationship between that payment and the upstream product cost must be specified separately. The threshold applies to the actual payment transaction, not to a per-unit allocation or an abstract product cost.
This distinction is essential to avoid a logical inconsistency between the assumed transaction value and the policy threshold.

8. Sensitivity Analysis

The following scenarios vary the assumed MDR rate while retaining five stages, a 5% mark-up at every stage and full pass-through. These are model scenarios, not a statement that all four rates are available under the policy.

Assumed MDR per stage	Final modelled value
0.0%	₹12,762.82
0.2%	₹12,890.96

0.4%	₹13,020.12
0.6%	₹13,150.32

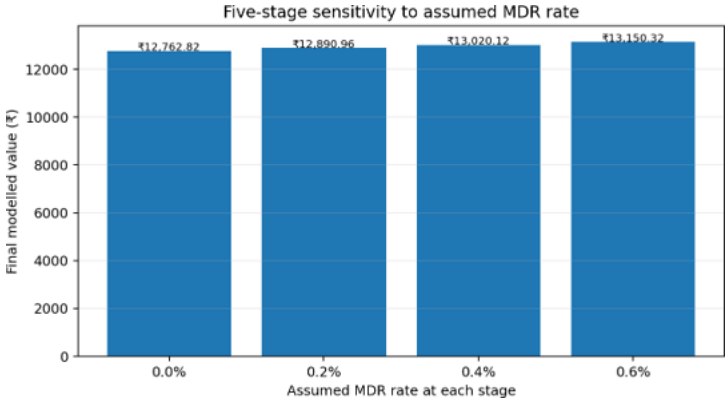


Figure 2. Five-stage final-value sensitivity to alternative assumed MDR rates.

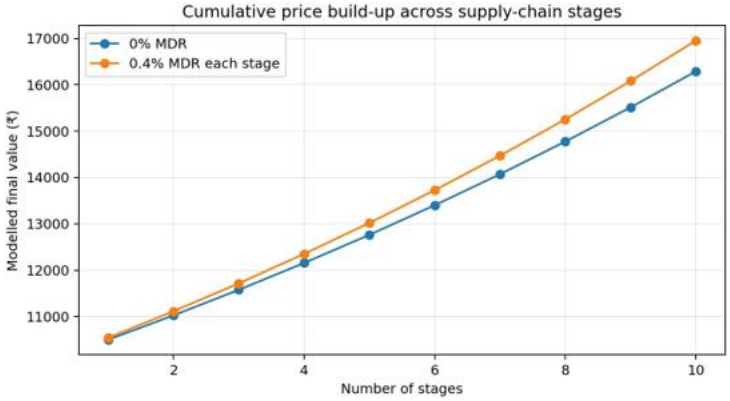


Figure 3. Cumulative value progression from one to ten stages, with and without assumed MDR.

9. Discussion

The model demonstrates a conditional cascading mechanism. If a merchant absorbs MDR, the immediate effect is a reduction in its contribution or margin. If the fee is passed forward, it raises the next buyer's landed cost. Where later sellers apply a percentage mark-up to landed cost, earlier MDR can also influence subsequent mark-up amounts.

The formal payment of MDR by a merchant does not establish who ultimately bears its economic incidence. Depending on competition, bargaining power, demand elasticity, contract terms and pricing practices, the cost may be absorbed by one or more businesses or passed partly to customers. The model assumes 100% pass-through and should therefore be interpreted as a specific scenario, not a universal market outcome.

The model does not establish that MDR causes general inflation. Estimating an inflation effect would require data on affected transaction volumes, merchant eligibility, sector weights, pass-through rates, price responses and substitution between payment methods.

10. Limitations and Further Research

- This is a deterministic conceptual model, not an empirical study using observed merchant-level transactions.
- The assumption that all five upstream/final transactions are eligible is a simplifying assumption; actual eligibility must be checked transaction by transaction.
- Full pass-through is assumed and may not occur in competitive markets.
- The 5% figure is a mark-up on cost, not a 5% net profit margin on sales.

- The model excludes transaction caps, sector-specific fee structures, exemptions, fixed charges and taxes on payment services.
- The below-₹2,000 sensitivity case cannot be treated as a qualifying exemption when its modelled final transaction is ₹12,968.25.
- Future research should use merchant invoices, actual MDR statements, sector-level data and observed price changes to estimate pass-through.

11. Conclusion

Under the specified five-stage assumptions, a 0.4% MDR applied to every eligible transaction increases the modelled final value from ₹12,762.82 to ₹13,020.12. The ₹257.31 difference consists of ₹234.03 in direct MDR and approximately ₹23.27 in downstream mark-up effects. When the fifth-stage MDR is switched off as a sensitivity case, the final value is ₹12,968.25, but that case does not meet the announced below-₹2,000 threshold if the fifth-stage payment is the full modelled amount.

The principal contribution of this paper is a transparent method for separating direct payment-processing fees from the additional cost effect created when earlier fees enter later cost bases. The model identifies a mechanism worth testing empirically; it does not by itself prove actual market-wide price increases or inflation.

References

[1] Press Information Bureau, Ministry of Finance, Government of India. (18 April 2025). "Claims that Government is considering levying Goods and Services Tax (GST) on UPI transactions over ₹2,000 are completely false, misleading, and without any basis." https://www.pib.gov.in/PressReleasePage.aspx?PRID=2122747

[2] Press Information Bureau, Ministry of Finance, Government of India. (15 September 2026). "UPI Continues to Remain Free for Peer to Peer Transactions and 96% of Merchant Transactions." https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=2310586&lang=2&reg=48

[3] Business Standard. (13 October 2026). "UPI MDR deferred until after Diwali, new date to be notified: NPCI." https://www.business-standard.com/finance/news/upi-mdr-deferred-until-after-diwali-new-date-to-be-notified-npci-126101300556_1.html

[4] Department of Financial Services, Ministry of Finance, Government of India. (15 September 2026). "FAQs on Merchant Discount Rate (MDR) on Select UPI (P2M) Transactions." https://financialservices.gov.in/faqs-merchant-discount-rate-mdr-select-upi-p2m-transactions

Appendix A. Reproducibility

Full MDR: $C_5 = 10{,}000 \times (1.05 \times 1.004)^5 = ₹13{,}020.12$.

Zero MDR: $C_5^0 = 10{,}000 \times (1.05)^5 = ₹12{,}762.82$.

Four MDR-bearing stages followed by a fifth 5% mark-up without MDR: $C_5 = 10{,}000 \times (1.05 \times 1.004)^4 \times 1.05 =$ ₹12,968.25.

All calculations use unrounded values at each intermediate stage and round only for presentation.