

UPI adoption and usage patterns by small merchants: a study

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Unified Payments Interface or UPI, is an application system in India that combines multiple bank accounts and features for direct payer to merchant transactions. There are over 25 UPI applications¹ and 458 participating banks as of June 2023.² With over 300 million UPI users and 500 million merchants, UPI has emerged as the most popular payment method in the country³, surpassing cash, debit and credit cards.

By August, 2023, it was reported that UPI had crossed 10 billion monthly transactions, and UPI transactions were worth 55% of India's GDP in FFY22. The staggering figures are not merely a function of volume, but also a function of time and pervasiveness of the adoption of UPI. Between FY19 and FY22, transactions grew 121% in value and 115% in volume⁴.

India's UPI story is especially compelling because of how it has provided a bridge to the digital economy to individuals across various strata without being concentrated in a particular industry or income-group. Be it a vegetable cart owner, a supermarket or a payment gateway in an online store, QR codes are virtually unmissable. The more interesting aspect is how it has hooked individuals who otherwise would have limited digital literacy into the digital economy, prompting the question: what is it about the incentives of using UPI that outstripped these barriers?

Objective of the study

This paper intends to investigate what are chief drivers for small merchants (such as local grocers, cart vendors and local marketplaces) and middle-lower income households to adopt UPI as a payment method.

¹ Kapron, Zennon. "Is India's UPI Real-Time Payments System Ready To Go Global?" *Forbes*, <https://www.forbes.com/sites/zennonkapron/2023/04/10/is-indias-upi-real-time-payments-system-ready-to-go-global/> . Accessed 29 Sept. 2023.

² "India: Banks on UPI 2023." *Statista*, <https://www.statista.com/statistics/1225867/india-banks-on-upi/> . Accessed 29 Sept. 2023.

³ Mistry, Mehul. "The Rise of UPI: Transforming the Way Indians Transact." *The Times of India. The Economic Times - The Times of India*, <https://timesofindia.indiatimes.com/blogs/voices/the-rise-of-upi-transforming-the-way-indians-transact/> . Accessed 29 Sept. 2023.

⁴ Kayastha, Anshika. "UPI Transactions Grow 44% to ₹15-Lakh Crore in July." *BusinessLine*, 2 Aug. 2023, <https://www.thehindubusinessline.com/money-and-banking/upi-transactions-grow-44-to-15-lakh-crore-in-july/article67149553.ece>. Accessed 25 Sept 2023.

Background

UPI was created in 2016 by the National Payments Corporation of India (NPCI) and is governed by the Reserve Bank of India (RBI), which oversees retail payment systems. UPI was launched the same year as the nationwide demonetisation with the common goal of fighting black money, and UPI was created with the intention to move India into a digital economy. UPI payments are real-time and use peer-to-peer-bank transfers through apps called 'Payment Service Providers' (PSPs). Unlike credit or debit cards, UPI charges zero Merchant Discount Rate (MDR) to incentivise small scale merchants and thus accelerate widespread adoption of UPI. The network incorporates the existing systems of Immediate Payment Service (IMPS) and Aadhaar Enabled Payment system (AEPS). The initial setup requires an Indian Financial System Code (IFSC) account number, mobile number and virtual ID/Aadhar. Each user is identified by their unique UPI ID and is linked to their phone number and their respective bank account, without needing to share account details. To receive money, a 'pull' system is used, where they enter the remitter's ID and amount, who will then receive a message and will authorize the payment by entering their UPI PIN. To send money, a 'push' system is used, wherein the payer enters beneficiary's ID and amount, then authorizes the payment using their PIN. All payments are free, instantaneous and the network is operational 24/7, with Rs.10 million as the transaction limit and maximum 20 payments per day.⁵

In 2018, the NPCI released UPI 2.0, which allowed users to pre-mandate transactions (scheduling future debits from the account), receive invoices in the inbox and allow linking of overdraft accounts⁶. This is in addition to being able to link saving accounts or prepaid wallets. Between 2020 and 2022, UPI Autopay was adopted wherein users can make recurring payments such as electricity or water bills through the app. As UPI reached a global scale, NPCI announced 'UPI Lite' in 2022, which allows a maximum transaction of Rs.500 without needing to enter a PIN, along with a cap on cumulative UPI payments at Rs. 4000 per day.⁷

In September 2023, RBI announced UPI Lite X, which can even work offline. The use of pre-sanctioned credit lines was also introduced around the same time, which allows users to link their credit cards to the UPI system.

Methodology

The initial study was concerned with the impact of UPI on small-scale retail merchants. 28 local shop sellers (local grocers, tobacco vendors, fruit/vegetable carts) in Gokuldhara (a residential

⁵ "Unified Payments Interface (UPI): Definition and How It Works." *Investopedia*, <https://www.investopedia.com/terms/u/unified-payment-interface-upi.asp> . Accessed 29 Sept. 2023.

⁶ BHIM. "Features & Benefits of UPI 2.0." *BHIM UPI*. Accessed 26 Sept 2023

⁷ Prasad, Dilip. "Difference Between UPI and UPI Lite." *A Comprehensive Guide to Money Transfer, Recharges, Bill Payments and Other Digital Payments | Paytm Blog*, 13 Mar. 2023, <https://paytm.com/blog/payments/upi/difference-between-upi-and-upi-lite/> . Accessed 19 Sept 2023



suburb of Mumbai with a population of approximately 20,000) were surveyed. Based on these results, the study was expanded to include the payers also.

33 payers/users from higher income levels, living within the nearby apartment complexes were surveyed via an online Google form since they represented the main paying segment to the small scale merchants in the Gokuldham-Film City region. Meanwhile, 15 payers/users from lower-middle income levels, working as drivers or house-helpers in the high income households were surveyed in-person or through a voice call. The questionnaires used for these surveys are given in the Annexures.

The questions produced data that was both qualitative and quantitative in nature. Since merchants many times did not have the exact data, they provided ranges, which were categorized into nominal data. Significance tests were carried out on some results and are discussed below.

Key Findings - Merchants

Why small merchants adopted UPI

When asked why merchants first set up UPI, about 70% of them stated that it was primarily 'for the customers'. Customers would often ask sellers for a QR code or would not have cash in the necessary denominations. It became a question of remaining competitive against other sellers who did have UPI systems installed whom customers would rather visit, and hence it transformed into a necessity to remain in business. This suggests that the UPI movement has been largely consumer-led rather than merchant-led.

Small merchants' preferred modes of payment

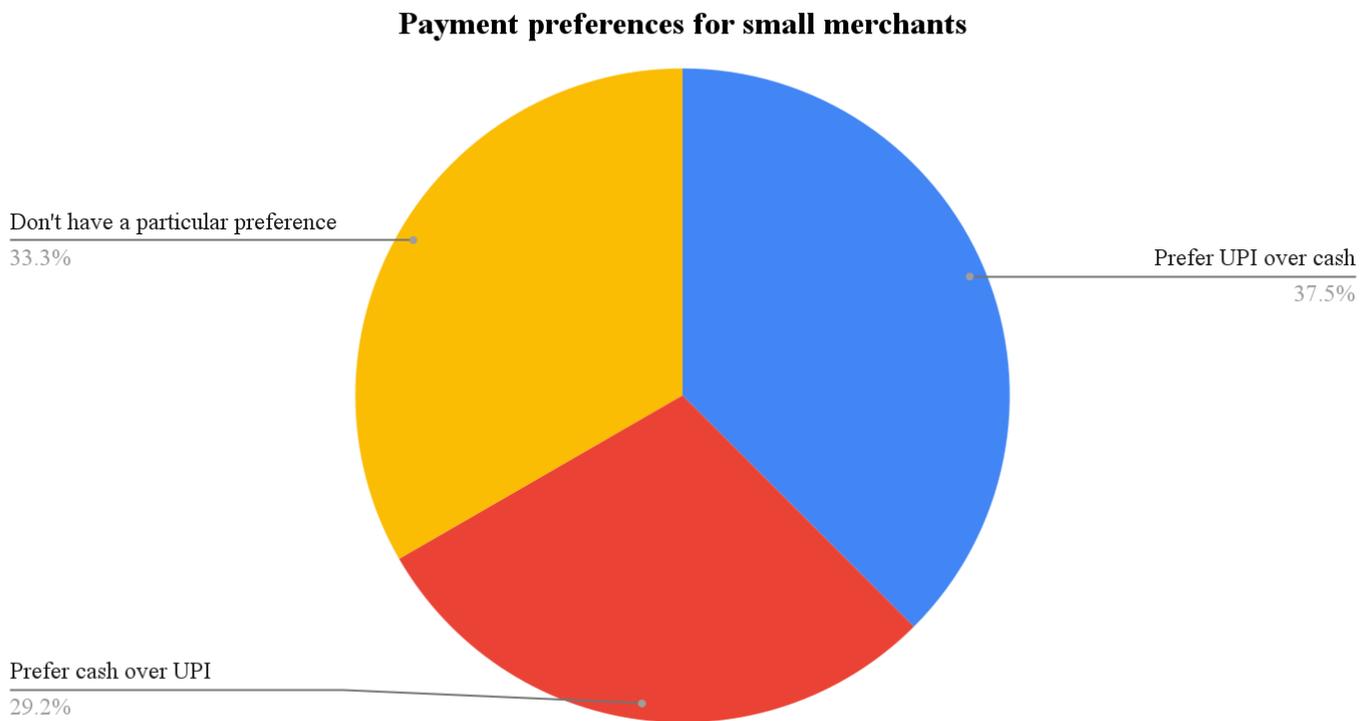


Fig 1

Merchants were also asked whether they preferred cash or UPI more than the other. The results, summarized in Fig 1, show that there was no clear general preference between UPI and cash. Those who **preferred UPI** stated benefits such as (a) being able to receive payments directly to their account (b) not needing to look for change or (c) expressed feelings of pride in being able to go 'digital'. Those who **preferred cash** stated that they would (a) often get to keep small amounts of additional cash if they couldn't return the appropriate change, (b) had difficulty coordinating remote purchases and deliveries and reminding customers when they forget to complete their payment or (c) some may also prefer cash so as to avoid tax. There were roughly the same number of people distributed in the three groups; first preferring UPI over cash, second preferring cash over UPI, or third having no particular preference between the two.

A chi square goodness of fit test was done to determine the significance of the deviances in payment preference between these three groups. This is to verify the assumption that there is no deviance between the groups; that is, an equal number of merchants prefer UPI over cash, cash over UPI, or have no preference. Therefore, a p-value less than 0.05 would indicate that there is significant variation and would disprove the assumption. The Chi square goodness of fit test showed that the distribution of merchants amongst the three groups was consistent with the expected distribution ($\chi^2 = 0.25$; $df = 2$; $p = 0.885$) and the deviances were not significant. (See Annexure 4)

It is likely that the zero MDR was not an incentive for merchants since UPI was a substitute to cash and not card for small-scale purchases, meaning there were no MRD charges to begin with.

Merchants were also asked what percentage of their customers use UPI on a daily basis, but many shopkeepers were not able to give a precise answer. The best some employees could indicate was ‘more than 50%’ or ‘less than 50%’, which yielded little use or conclusion.

The result of this study highlighted that merchants were simply adapting to or mirroring the consumers’ behavior. Hence, the survey was extended towards a sample of the predominant payers in the region to investigate the root incentives to use UPI.

Key Findings - Payers

The following observations were common to both payer groups - higher income and middle-lower income.

Commencement of UPI Utilisation by individuals

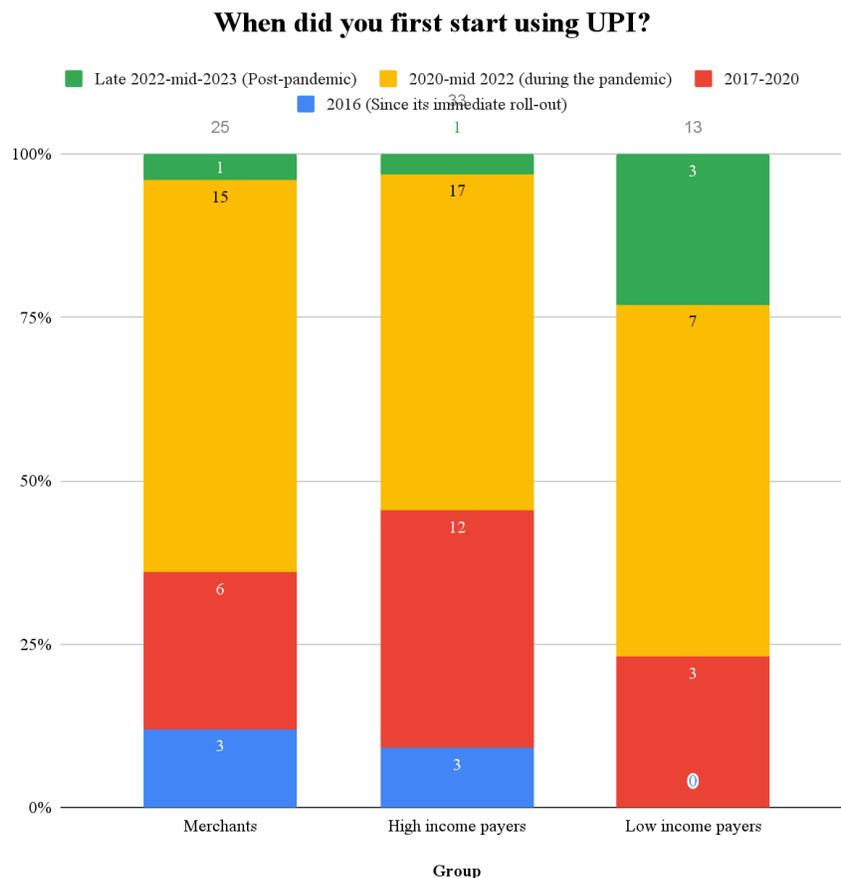
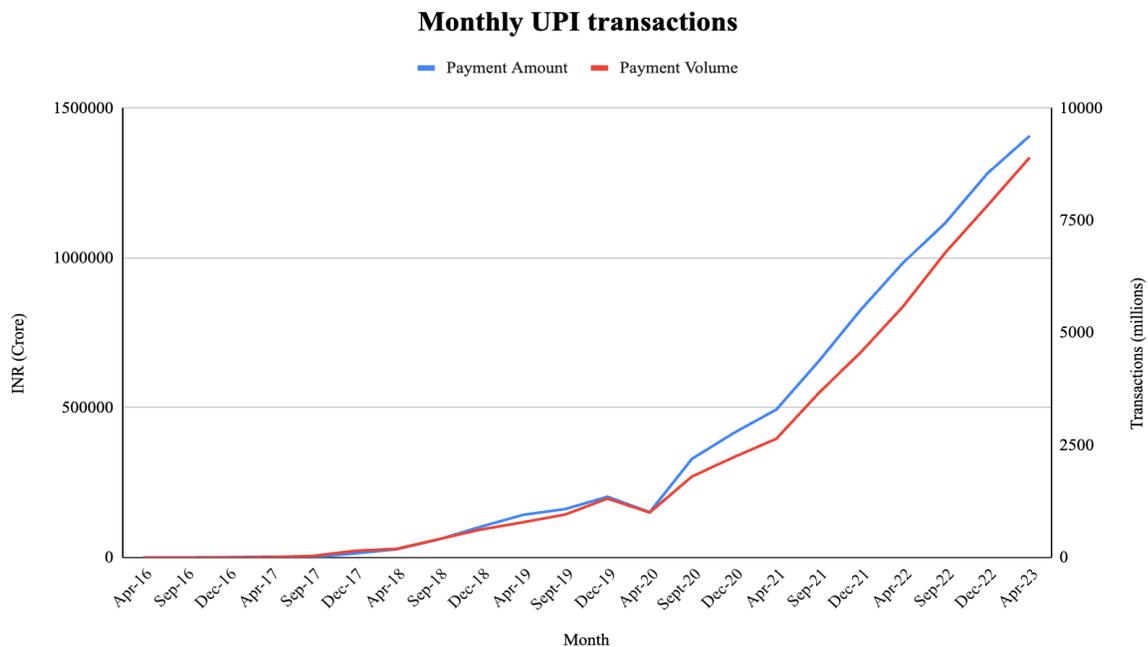


Fig 2

Payers were asked when they first started using UPI. The majority of both payer groups as well as the merchant group began using UPI during the pandemic period, classified from 2020 to mid 2022, as Fig 2 shows. However this adoption was more delayed amongst the lower income group; none of those surveyed from the lower income group used UPI when it first rolled out, a smaller proportion of them used UPI before the pandemic compared to the higher income group, and a relatively larger proportion in the lower income group first began using UPI a year ago or lesser.

Both payer groups were asked what advantages of UPI they experienced. The low-income group was asked to list the ones that they personally experienced, while the high-income group was asked to rank a few commonly experienced benefits by significance, and also list some of their own. Both groups stated that the non-availability of smaller currency denominations has made UPI beneficial to pay smaller amounts. This is consistent with the fact that both groups stated they largely used UPI for smaller transactions, such as grocery shopping or street vendors. Both groups welcomed the idea of going ‘cashless’ for the simple reason of convenience or in situations when one forgets their wallet. Additionally, both groups appreciated the fact that payments can be made remotely, from the comfort of one’s home. This can be correlated with the sharp increase in UPI payments during the pandemic recorded by the NPCI (See Fig 3) which was the main reason for increased contactless payments and home deliveries.⁸



⁸ NPCI. “UPI Product Statistics.” NPCI, <https://www.npci.org.in/what-we-do/upi/product-statistics> . Accessed 29 Sept 2023.

Fig 3

Role of payment context in usage behavior

High income payers were asked to check off the various payment methods they used in different payment contexts. Fig 4 and Fig 5 suggest UPI usage trends in the **high-income group** between two different parameters: the physicality of the transaction and the value of the transaction.

Preferred modes of payment in different contexts (high-income group) before UPI

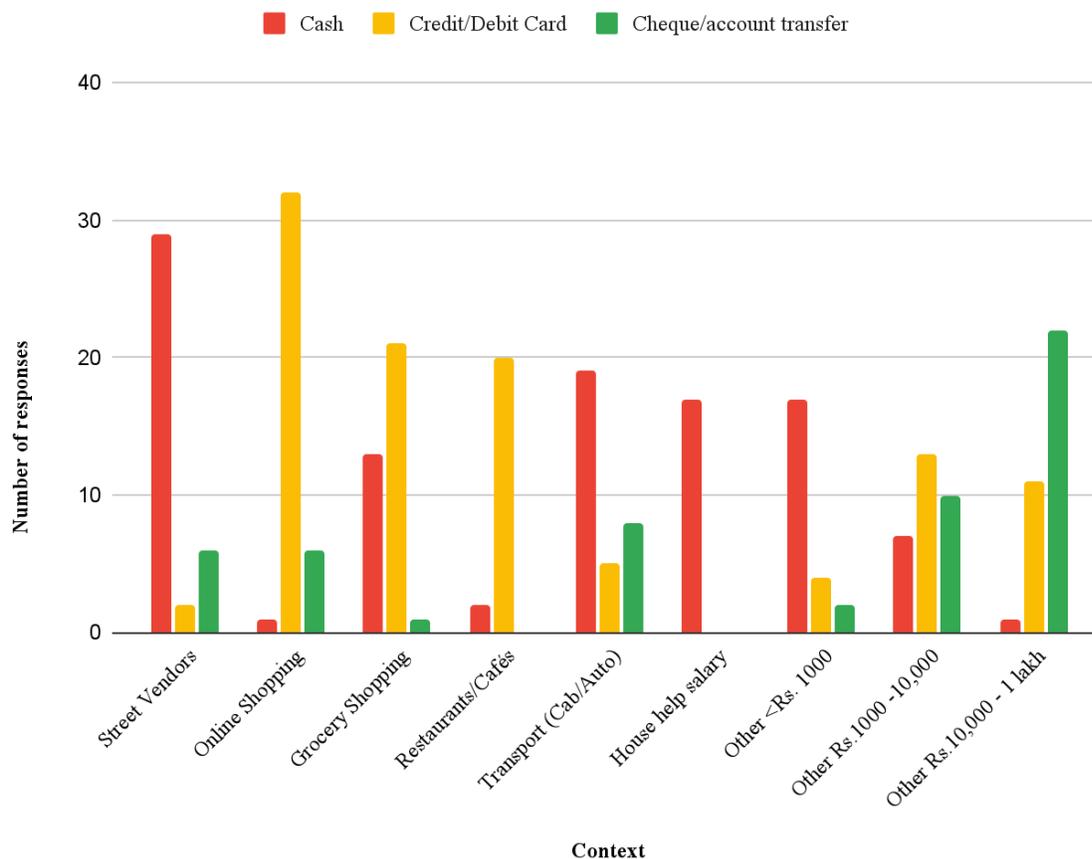


Fig 4

Physicality: Certain physical transactions, such as payments to street vendors, grocery shopping, transport, or even paying house help salaries, were most affected due to COVID-19 lockdowns and general reluctance to make avoidable contact. These contexts tend to be the same ones where cash was the popular payment, as per Fig 4. Hence, the most popular of UPI payments began in these very contexts owing to its contactless nature and ability to verify payment proof and continue to do so due to inertia, even post-lockdown. Restaurants/Cafés is the exception here, since credit card and not cash, was the predominant mode of payment before COVID-19, and therefore the same credit card mechanism could be continued online

using delivery apps. Post-lockdown, users resumed using credit cards since sit-in restaurant dining habits resumed when COVID-19 fears of making contact with others subsided, and without this fear of making contact, payers didn't see a reason to substitute UPI for credit cards.

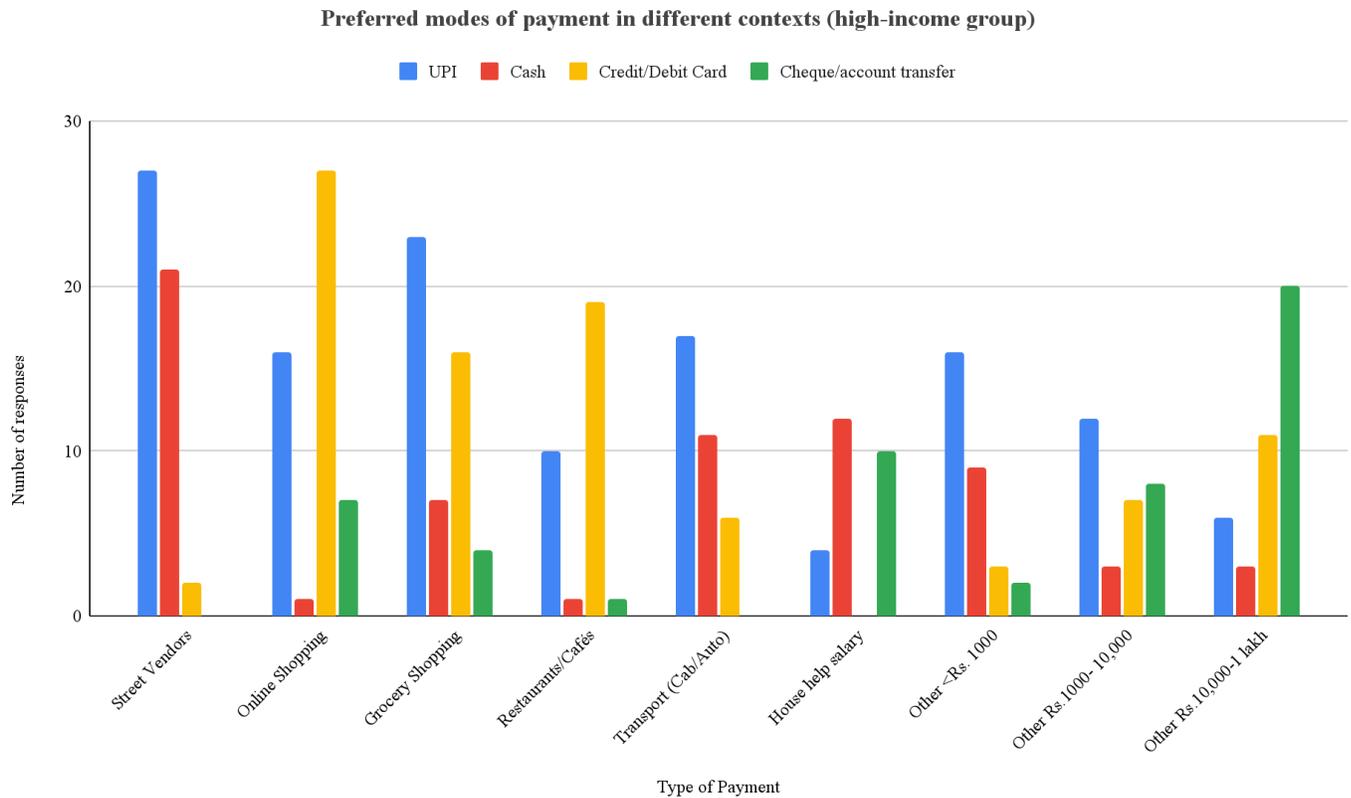


Fig 5

Value of transaction: As per Fig 5, UPI's popularity is also determined by the size of the payment; payments to street vendors or other payments less than Rs. 1000 are categories where UPI is the most popular mode of payment.

Other stated benefits and grievances which were common to both groups

Both groups pointed out the advantages of having ready payment proof which is accessible even after the transaction has been made. This cannot be tracked when using cash, and with bank transfers one must wait longer for the bank statement.

However, they also indicated the troubles of sending money to incorrect UPI IDs by mistake, in which case resolving or undoing payments is a hassle and dependent on the other party.

Usage patterns unique to low income earners

Amongst the lower-middle income earners, a few additional usages of UPI, not otherwise stated by higher income earners, were observed. These included lending money to friends or family for emergency purposes, for food/drink (often in street-carts) or sending money back home to the village. Moreover, out of the 15 lower-middle income individuals surveyed, 3 reported not using UPI at all, which could suggest it's lower popularity in this group.

Limitations of the study

The collective quantitative data were usually estimates, answered intuitively by the employees in the shops, which limits the accuracy of the results. Moreover, in some shops where the owner was absent, employees would answer instead. Some of them indicated that they were new and joined after COVID or were inexperienced, meaning they could only give a limited picture of their sales or consumers' behavior. Additionally, the survey of low-income payers primarily included males working as drivers or house-help. Only four females were interviewed, out of which only two used UPI. Some were shy and refused to answer, or simply agreed with all options suggested to them. This implies that they might not have given their true answers due to their acquiescence bias, and the representation of women in this survey was limited.

Suggestions for PSPs

Targeting payers first: Adoption of UPI has largely been led by consumers, with merchants following what the consumer demands. This attests to the importance of marketing towards this group of stakeholders for expanding consumer bases geographically.

UPI is essential to stay competitive as a seller: PSPs must emphasize how UPI and COVID have become so integrated into the local market ecosystem that any small merchant who doesn't accept UPI is likely to lose sales to their competitors who do accept it. This should be a focal point in their case when engaging more small-scale merchants with the UPI systems rather than marketing zero MRD.

Rural India: UPI payments and digital transactions have not caught up in rural India as much as urban ecosystems. An April 2022 survey by 1Bridge observed only 3-7% usage of UPI in rural India. 40% of customers were unaware of UPI and feared losing money through the payment mechanism⁹. 65% of India's population lives in rural areas, which contribute between 25-30% to India's GDP. Prioritizing the increase of digital literacy amongst Tier-2 and Tier-3 cities can tap into these regions' potential, while also developing trust in digital payments. Points that can be marketed and highlighted to rural consumers include reduced pick-pocketing crime - which the above survey also revealed - and the ability for workers to send money from cities back home to their villages without needing to visit the bank.

⁹ Livemint. "UPI Transactions Surge 650% in Semi-Urban, Rural Stores: PayNearby." *Mint*, 6 Dec. 2022, <https://www.livemint.com/money/personal-finance/upi-transactions-surge-650-in-semi-urban-rural-stores-paynearby-11670311587769.html> . Accessed 22 Sept 2023.

Closing the gender gap: The State of India Digital Economy Report, 2023, reported the prevailing existence of pronounced gender gaps, especially in rural areas¹⁰. UPI can act as an instrument to financially empower women across income groups by focusing on improving digital literacy within this demographic.

A more inclusive and global implementation

As UPI flourishes as the most preferred mode of payment in India, other countries look to India's model to recreate this phenomenon. UPI's Indian success story has been attributed to various factors, including COVID-19 for urging more payers and merchants onto the network, thus increasing its acceptability and widespread use. However, there are some key roadblocks that countries will face in this process.

UPI payment methods are heavily dependent on external factors such as internet connectivity, bank account activity and mobile phone usage. According to the 1Bridge survey, 10% of village inhabitants in India itself reported having low bank balance or inactive bank accounts as reasons for no UPI adoption¹¹. Low digital literacy and trust are also factors that come into play, along with less digital infrastructure for internet connectivity. Therefore overcoming this inertia is a high investment of time and costs for the Indian government as well as foreign governments looking to adopt UPI on a large scale.

In developed countries like the US, a model with zero merchant discount rate or transaction fees is likely to face opposition from large credit card companies, such as MasterCard, Visa or Discover. Existing regulatory framework would suggest that the Federal government of the US would prefer to steer away from competing against the private sector by creating its own payment system or mandate zero transaction fees. Moreover, existing payment methods adjacent to UPI, such as Apple Pay, Paypal or Venmo which are well established might create inertia against change.

Extensions

The results of this study reveal conclusions that branch further implications and scope for study. Additionally, seeing newer and faster developments in UPI technology can alter its usage patterns even more drastically in the coming months and years. The above study can therefore be extended to investigate the following:

Effect of UPI on low income groups' habits of lending habits between friends and family:

Surveyed drivers in the low income groups highlighted how UPI has made lending between friends and family easier. One can study whether UPI has increased the frequency of such

¹⁰ Mishra, Deepak, et al. *State of India Digital Economy (SIDE) Report*. Indian Council for Research on International Economic Relations (ICRIER), Feb. 2023, pp. 76–81, https://icrier.org/pdf/State_of_India_Digital_Economy_Report_2023.pdf . Accessed 23 Sept 2023.

¹¹ Livemint. "UPI Transactions Surge 650% in Semi-Urban, Rural Stores: PayNearby." *Mint*, 6 Dec. 2022, <https://www.livemint.com/money/personal-finance/upi-transactions-surge-650-in-semi-urban-rural-stores-paynearby-11670311587769.html> . Accessed 23 Sept 2023.



borrowings/lendings, changed the average amounts of these transactions and impacted the paying-back of these borrowings as payment proof is more transparent with UPI than with cash.

UPI preferences for larger merchants, chains or online shops: For these sellers, the predominant mode of payment before UPI popularization was not cash, but other modes such as card or cheque/alternative modes of bank transfer where they were already paying MDR. Conducting a survey for these shops to gauge their incentives for UPI and their preferences between the two payment modes can reveal if the zero-MDR feature is more influential in their decision.

UPI credit and its role on usage behavior: So far, UPI substituted for cash payments due to lockdown and it has remained like so ever since. However, it hasn't had as profound an effect in substituting credit card payments. Whether new features that allow linking of credit cards will fully substitute usage of physical cards can be studied.

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Annexure 1: Questionnaire for merchants

- When did you start using UPI?
- What pushed you to start using this mode of payment?
- Do you prefer UPI or cash?
- What are your grievances with this method?
- Have you noticed any difference in your sales after you started using UPI?
- Approximately what percentage of your customers use UPI?



Annexure 2: Online Google Form Questionnaire to High Income Payers

UPI Payment Usage Survey

As part of my school project, I'm researching the impact of UPI on payers and merchants' behaviours. I hope you can take just a few minutes to fill out this questionnaire about how you personally use UPI as a consumer. This form is completely anonymous and does not collect names or email IDs.

* Indicates required question

1. When did you first start using UPI as a mode of payment? * *Mark only one oval.*

- When it launched in 2016
- Between 2016 and March 2020
- April 2020 - December 2020
- After January 2021
- Other:

2. What pushed you to start using this payment mode? *



3. How did you pay for certain items/vendors before using UPI? *

Check all that apply

	Street Vendors	Online Shopping	Grocery shopping	Restaurants /Cafés	Transport (Cab/Auto)	House-help salary	Other physical payments <Rs.1000	Other physical payments between Rs.1000 and 10,000	Other physical payments between Rs. 10,000 and 1 lakh
Cash									
Credit									
Cheque/Bank transfer									

4. What items/vendors do you tend to use the following payment methods more than the other two today? *

Check all that apply.

	Street Vendors	Online Shopping	Grocery shopping	Restaurants /Cafés	Transport (Cab/Auto)	House-help salary	Other physical payments <Rs.1000	Other physical payments between Rs.1000 and 10,000	Other physical payments between Rs. 10,000 and 1 lakh
UPI									
Cash									
Credit									
Cheque/Bank transfer									



5. Rate the following five commonly stated benefits of UPI (1 being the most significant advantage in your experience and 6 being the least significant) *Mark only one oval per row.*

Not having to worry about change

Instantaneous transaction

Accessibility from phone

Being able to use different bank accounts on the same app

Safe and RBI-regulated

No physical contact

6. Have you experienced any other advantage while using UPI which was not mentioned in the table above?



7. Rate the following three commonly stated drawbacks of UPI (1 being the most significant drawback in your experience and 5 being the least significant) *

Mark only one oval per row.

A 6-digit pin is not enough security

Risk of online fraud or false sellers

Dependent on internet connectivity

App and interface is too complicated

May not be accepted in all shops

8. Have you experienced any other drawback while using UPI which was not mentioned in the table above?*

9. Which application do you use for UPI payments? * *Mark only one oval.*

Google Pay

PhonePe

PayTM

BHIM App

MobiKwik

Your bank's interface

10. How likely are you to use UPI to pay someone living abroad? * *Mark only one oval.*

Not likely 1 2 3 4 5 Very likely

Annexure 3: Questionnaire to low-income payers

- when did you start using UPI?
- what pushed you to start using this mode of payment?
- what kind of shops/payment amounts do you tend to use UPI the most?
- what benefits have you personally experienced with UPI?
- What are your grievances with this method?

Annexure 4: Chi square goodness of fit calculation

Category	Observed Value (O)	Expected Value (E)	(O-E) ²	(O-E) ² / E
Prefer UPI over cash	9	8	(9-8) ² = 1	0.125
Prefer cash over UPI	7	8	(7-8) ² = 1	0.125
Don't have a particular preference	8	8	(8-8) ² = 0	0

$$\chi^2 = 0.125 + 0.125 + 0$$

$$\chi^2 = 0.25$$

$$d.f = 3-1$$

$$d.f = 2$$

v	α						
	0.40	0.30	0.20	0.15	0.10	0.05	0.025
1	0.325	0.727	1.376	1.963	3.078	6.314	12.706
2	0.289	0.617	1.061	1.386	1.886	2.920	4.303
3	0.277	0.584	0.978	1.250	1.638	2.353	3.182
4	0.271	0.569	0.941	1.190	1.533	2.132	2.776
5	0.267	0.559	0.920	1.156	1.476	2.015	2.571
6	0.265	0.553	0.906	1.134	1.440	1.943	2.447
7	0.263	0.549	0.896	1.119	1.415	1.895	2.365
8	0.262	0.546	0.889	1.108	1.397	1.860	2.306
9	0.261	0.543	0.883	1.100	1.383	1.833	2.262
10	0.260	0.542	0.879	1.093	1.372	1.812	2.228
11	0.260	0.540	0.876	1.088	1.363	1.796	2.201
12	0.259	0.539	0.873	1.083	1.356	1.782	2.179
13	0.259	0.538	0.870	1.079	1.350	1.771	2.160
14	0.258	0.537	0.868	1.076	1.345	1.761	2.145
15	0.258	0.536	0.866	1.074	1.341	1.753	2.131

Since $2.5 < 2.920$, null hypothesis cannot be rejected, and test was not significant.