REPORT ON ADOPTION OF UPI AMONG STREET VENDORS- DRIVERS AND BARRIERS IN DELHI NCR

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1. Introduction

India has witnessed a notable transformation in payments, over the last decade. This was largely driven by the demonetization policy of 2016, which increased digital financial adoption significantly. The Government of India has launched initiatives like Jan Dhan Yojana, Digital India, UPI by National Payments Corporation of India to promote digital financial inclusion.Even then in 2025, there still exists gaps here. Adoption rate is high for urban and educated segments, at the same time there still persist gaps among informal low income groups like street vendors. These vendors are an important part of the working population, offering affordable goods and services. Despite the benefits of digital payments such as convenience, safety, transparency, and access to formal credit systems adoption among street vendors remains limited.

This research was carried out among street vendors of Delhi and NCR to have a better understanding of this gap, and to find out if UPI adoption has a significant impact on the daily average revenue of street vendors via PSM. Data for the study were collected from twenty street markets located in Delhi and NCR, including both central urban hubs and semi urban areas. The survey collected information about UPI usage, daily average revenue, demographic background, basic digital and financial literacy, type of goods and services sold, and access to formal credit etc. The survey was aimed to understand awareness, preferences, and experiences with digital payment systems, along with the factors influencing their decision to adopt or avoid UPI. This analysis is of relevance to policymakers since street vendors represent a crucial share of India's informal urban working population.. To achieve a digital and cashless economy, it is essential to understand the challenges, drivers, and barriers that affect the adoption of digital payment systems among this group.

2. Literature Review

Existing research on adoption of digital payments in India reveals that multiple technological, social, and behavioral factors collectively influence how users interact with platforms such as the Unified Payments Interface (UPI). In India’s push toward a cashless economy UPI has played a crucial role. Various studies have revealed different barriers examined by the varied perspectives which highlighted challenges like lack of digital literacy, lack of trust in the digital financial system, poor connectivity and lack of smartphone access. This literature review examines existing research to consolidate the primary determinants of UPI adoption. It majorly focuses on how the decision of adoption of UPI depends on technological access, behavioral and socio-economic factors and digital participation.

2.1 Adoption Gaps & Digital Inclusion

In comparison to formal retailers, there is a troubling gap in UPI adoption among vendors in Chandni Chowk: only one in four vendors used UPI to pay for evening meals, while two in three retailers used UPI for meals, according to Jain and Khanna (2022).

This demonstrates that the benefits of digital finance have not been evenly distributed. Literature on financial inclusion also suggests that there has been limited access to formal banking networks, training opportunities and awareness programs to vendors which ultimately slow down technological progress.

2.2 Infrastructural Barriers

The rapid adoption of digital payment methods is majorly hindered by insufficient infrastructure. Dasgupta (2023), highlights that transaction failures, poor connectivity and lack of digital infrastructure especially in crowded marketplaces actively discourage small vendors from using digital platforms for online payments.Reliable connectivity and user -friendly systems are essential for promoting sustained online systems for payments.According to Mehrotra et al (2021), complicated interfaces and inconsistent application performance frustrate the user, creating distrust in the system.

2.3 Behavioral and Trust Barriers

Adoption behavior goes beyond technological barriers; behavioral and psychological barriers need to be considered. One of the biggest factors limiting adoption is a distrust for digital transactions and fear of being scammed through digital platforms (Srivastava and Singh, 2023). Word-of-mouth accounts of fraudulent schemes often reinforce this cautious stance, which solidify the preference for cash. Research by Panda and Sahoo (2022) explains an irregular income pattern among the informal economy, along with stress about increased tax scrutiny, contributing to the enduring cash dependence.

2.4 Lack of Digital Literacy & Awareness

The adoption decision is not solely affected by infrastructural and behavioral factors but also by the ability of the vendor to use smartphones and UPI apps effectively. Rizwana, Khan, and Iqbal (2021) revealed in a study that around 75% of surveyed vendors neglected UPI mainly due to their limited knowledge and lack of confidence. This issue was observed more among older and semi- urban vendors who were struggling with understanding the digital system.Therefore it has become important to strengthen digital education, for their meaningful inclusion in the digital economy.

2.5 Gaps in Empirical Research

Prior literature gave valuable insights into behavioral and infrastructural barriers but still there is limited empirical analysis on how UPI adoption directly affects business outcomes. There are few studies that assess whether digital adoption improves revenue, sales, or customer reach. The studies have not been measured using advanced econometric methods, such as Propensity Score Matching (PSM) in this domain to establish any causal relationships between UPI usage and vendor performance. Propensity Score Matching (PSM) and other advanced econometric methods are infrequently utilized in this field to establish a causal link between the adoption of UPI and improvements in vendor performance.

2.6 Summary

The existing body of research reveals the existence of limited integration into India's expanding digital economy. Weak internet connection, frequent transaction failures, and the complexity of digital payment apps create hindrance for small vendors along with limited digital literacy and a lack of institutional support. Behavioral factors like fear of scams, tax regarding concerns, and mistrust in the digital payment system leads to cash dependency, particularly among older and semi urban vendors.

Despite enhanced attention towards the drivers and barriers of adoption, the empirical evidence on its measurable performance impact has not been emphasised enough. The studies have explored perspectives and challenges qualitatively rather than quantifying its impact on business outcomes such as revenue growth, transaction efficiency, or customer interaction. Analytical techniques like Propensity Score Matching (PSM) have been rarely applied to study the causality in this topic. There is this need for comprehensive research examining how UPI adoption influences the economic performance and digital financial inclusion of the street vendors within India's informal economy due to lack of rigorous empirical investigation.

Previous research has identified various determinants: poor connectivity, low literacy, fear of fraud, and cash dependency but provides minimal quantitative evidence on the economic advantages or influence of UPI for micro-entrepreneurs. This study aimed to bridge that gap by analyzing how digital payment adoption has any causaulity to vendor revenue and business growth in Delhi–NCR using a Propensity Score Matching Method.

3. Research Methodology

The present study adopted a **mixed-method research design** to incorporate both quantitative and qualitative components to analyze the adoption of Unified Payments Interface (UPI) among street vendors in Delhi–NCR. The mixed design was chosen purposefully because while quantitative data can statistically establish the relationship between UPI adoption and business outcomes, qualitative field observations are essential to understand the behavioral, infrastructural, and social constraints that influence those outcomes.

Field surveys and structured interviews were the main sources of primary data used in the study. The fieldwork was carried out between **June and July 2025**, during which the research team visited twenty markets representing both urban and semi-urban areas of Delhi and its adjoining regions. These markets differed widely in terms of vendor density, connectivity, customer base, and exposure to digital transactions. This diversity allowed the analysis to reflect varying degrees of digital inclusion across the informal economy of the region.

3.1 Research Design

A **structured questionnaire** was designed before large-scale data collection. Our questionnaire consisted of both closed and open-ended questions to capture a wide range of variables — from socio-demographic information and business characteristics such as payment preferences and perceptions about digital transactions. The survey also incorporated behavioural aspects such as trust in financial institutions, fear of fraud, and perceived benefits of UPI.

Quantitative data were collected through direct interviews, while qualitative insights were obtained via informal conversations and short field notes maintained by the survey team. The use of face-to-face interviews allowed the researchers to clarify doubts, minimize non-responses, and observe vendors' reactions when discussing digital payments — information that often cannot be captured through the standard techniques.

3.2 Sampling Framework and Market Selection

The sampling design was **representative random sampling**. 20 markets were selected across Delhi and NCR, stratified into **urban** and **semi-urban** categories. Markets were chosen based on three major criteria:

1. **Vendor density and diversity** – to include both high-traffic markets (e.g., Connaught Place, Janpath, Karol Bagh) and localized clusters (e.g., Shahdara, Loni).

2. **Degree of digital penetration** – to ensure representation of both digitally advanced and lagging regions.

3. **Business composition** – inclusion of food, apparel, and general goods vendors to reflect sectoral diversity.

The final dataset included **188 vendors**, including **152** belonging to urban markets and **36** to semi-urban markets. Around 79.3% of respondents reported using UPI, while the remaining relied mainly on cash or card-based transactions. On average, each market contributed 8–10 observations, ensuring proportional representation. Within each market, vendors were randomly selected after stratifying by vendor type (food, clothing, accessories, etc.) to minimize sampling bias.

This sampling design facilitated meaningful comparisons across geography, gender, and education, while maintaining adequate statistical balance between users and non-users of digital payments.

3.3 Data Collection Procedure

Fieldwork was conducted over **six weeks**, typically between 10 a.m. and 5 p.m. to coincide with vendor availability. Interviews were conducted in **Hindi** and **English** depending on the comfort of the respondent. The average interview lasted 12–15 minutes.

The questionnaire recorded; **Demographic attributes** – age, gender, education, and years of vending experience. **Business attributes** – product type, location, average daily sales, and number of customers. **Digital access** – smartphone ownership, internet reliability, frequency of UPI use. **Financial inclusion indicators** – bank account access, credit availability, and savings behavior. **Perceptions and barriers** – trust in UPI, fear of fraud, transaction failures, and awareness of micro-finance schemes such as PM-SVANidhi.Where possible, enumerators verified responses by observing transaction methods at the vendor's stall. Informal discussions often revealed unrecorded experiences — such as how vendors coped with network failures or handled fake payment screenshots — which were noted as qualitative evidence.

3.4 Variables and Data Specification

For quantitative estimation, the following variables were defined:

Variable	Definition	Type
Revenue_i	Average daily revenue (₹)	Continuous
UPI_i	Whether vendor uses UPI (1 = Yes, 0 = No)	Binary
Edu_i	Years of formal education	Continuous
Years_i	Years of vending experience	Continuous
MarketType_i	1 = Urban market, 0 = Semi-urban	Binary
Age_i	Age of vendor	Continuous
Gender_i	1 = Male, 0 = Female	Binary
Smartphone_i	1 = Owns smartphone, 0 = No smartphone	Binary
CreditAccess_i	1 = Has access to formal credit, 0 = No access	Binary

3.5 Empirical Strategy

The empirical analysis aimed to estimate the **causal effect of UPI adoption on vendor-level business performance** while addressing selection bias — since vendors who choose to adopt UPI may systematically differ from those who do not. To address this issue, a **Propensity Score Matching**

(PSM) framework was employed, followed by a **robustness check using Ordinary Least Squares (OLS) regression**.

1. **Propensity Score Estimation**
   A logistic regression model estimated each vendor's probability of adopting UPI given observable characteristics:

   $$P(UPI_i=1) = logit^{-1}(\alpha + \beta 1Edu_i + \beta 2Years_i + \beta 3MarketType_i + \beta 4Age_i + \beta 5Gender_i + \beta 6Smartphone_i + \beta 7CreditAccess_i)$$

   The resulting probability score represents the likelihood of UPI adoption for each vendor.

2. **Matching Procedure**
   We applied **1-to-1 nearest-neighbor matching with caliper restriction (0.10)** to ensure only high-quality matches. This was a step necessary so that the unmatched vendors were excluded from the analysis to maintain comparability. Balance tests confirmed that post-matching differences in covariate means were statistically insignificant, implying successful reduction of bias.

3. **ATT Estimation**
   The **Average Treatment Effect on the Treated (ATT)** was computed as:

   $$ATT = E(Revenue\_UPI = 1) - E(RevenueMatched\_Non-UPI)$$

   which measures the average revenue gain among vendors who adopted UPI relative tonon-users.

4. **OLS Regression for Robustness**
   To verify consistency, an OLS regression model was estimated as:

   $$Revenue_i = \alpha + \delta UPI_i + \gamma 1Edu_i + \gamma 2Years_i + \gamma 3MarketType_i + \gamma 4Age_i + \gamma 5Gender_i + \gamma 6Smartphone_i + \gamma 7\ CreditAccess_i$$

The coefficient δ captures the marginal effect of UPI adoption on revenue while controlling for all other vendor attributes.

3.6 Ethical Considerations

Before each interview, vendors were informed about the academic nature of the research and assured confidentiality. No personal financial information such as bank details was collected. Participation

was voluntary, and respondents were free to withdraw at any stage. The team also ensured that fieldwork did not disrupt business operations or attract suspicion of regulatory surveillance, a concern frequently raised by semi-urban vendors.

4. Data Analysis

This section presents the analytical results derived from the primary dataset collected from 188 street vendors operating across 20 markets in Delhi and the National Capital Region (NCR). The analysis combines **descriptive statistics**, **Propensity Score Matching (PSM)** results, and **robustness checks using Ordinary Least Squares (OLS)** method. It also incorporates **qualitative insights** obtained through field interviews which provide contextual interpretation of the econometric findings.

4.1 Descriptive Statistics

149 vendors (79.3%) of the 188 observations in the sample reported using UPI as a payment method. The remaining 39 vendors mostly used cash transactions and were not adopters. The vendors ranged in age from 18 to 63, with a **mean age of about 37**. The majority of respondents appeared to have completed at least middle school, as evidenced by the average of nine years of formal education.

About 81% (152 vendors) of the sample were located in urban markets, while 19% (36 vendors) were located in semi-urban markets.

Additionally, there was a noticeable spatial variation in the adoption of UPI: 82% of vendors in urban markets accepted digital payments, while 66% of semi-urban vendors did the same. This discrepancy is consistent with variations in internet dependability and digital infrastructure that were noted during fieldwork.

In terms of digital adoption, there was a clear gender disparity: only 55% of female vendors were active UPI users, compared to 80% of male vendors. According to conversations during interviews, two major deterrents frequently mentioned by female vendors were their lack of technical literacy and their insecurity when using smartphones.

In terms of income, the **average daily revenue** among UPI users was approximately **₹8,950**, while non-users earned around **₹6,900**, implying a **raw revenue gap of nearly ₹2,000 per day** (roughly 29%). Though this difference does not yet control for observable vendor characteristics, it provides an early indication of potential gains associated with digital adoption.

Sectoral heterogeneity was also observed:

- The highest average revenue and UPI usage were seen by food and general merchandise vendors.
- Due in part to erratic transaction frequency and smaller ticket sizes, vendors offering services or handicrafts demonstrated comparatively lower adoption and earnings.
- In semi-urban clusters like Shahdara and Najafgarh, street vendors cited cash-dominant clients and erratic internet connectivity as the main obstacles.

Vendors in urban clusters like Connaught Place, Dilli Haat, and Janpath, on the other hand, characterized UPI as *"almost necessary"*, with many pointing out that consumers anticipate digital options and that declining UPI could result in lost business.

These trends show how technology, location, and social capital interact in a complicated way to influence payment decisions, providing the groundwork for the causal analysis that follows.

4.2 Propensity Score Estimation and Covariate Balance

The study employed a **Propensity Score Matching (PSM)** framework To evaluate the **causal impact of UPI adoption** on vendor revenue while reducing selection bias. A **logistic regression model** of the following form was used to estimate each vendor's propensity score, which represents the likelihood of implementing UPI given observed characteristics:

$$P(UPI_i=1) = logit^{-1}(\alpha + \beta 1 Edu_i + \beta 2 Years_i + \beta 3 MarketType_i + \beta 4 Age_i + \beta 5 Gender_i + \beta 6 Smartphone_i + \beta 7 CreditAccess_i)$$

Where:

- Edu_i: years of education
- Years_i: vending experience
- MarketType_i: 1 for urban markets, 0 for semi-urban
- Age_i: vendor’s age
- Gender_i: 1 for male, 0 for female
- Smartphone_i: ownership dummy
- CreditAccess_i: formal credit access dummy

4.2.1 Regression Output Summary

The logistic regression yielded statistically significant and intuitively consistent results: **Education** ($\beta 1 > 0,\ p < 0.10$): Vendors with more years of schooling had higher odds of adopting UPI, consistent with the role of digital literacy in technology adoption. **Smartphone Ownership** ($\beta 6 > 0,\ p < 0.10$): The presence of a smartphone was one of the strongest predictors, highlighting infrastructural dependence. **Market Type** ($\beta 3 > 0,\ p < 0.10$): Vendors in urban markets had significantly greater adoption likelihood due to better connectivity and customer expectations. **Age** ($\beta 4 < 0,\ p < 0.05$): Older vendors were less likely to adopt UPI, confirming an age-related digital divide. **Gender** ($\beta 5 < 0,\ p < 0.05$): Male vendors had higher adoption probabilities than females, reaffirming gender-based disparities in financial inclusion. **Access to Credit** ($\beta 7 > 0$) showed a positive but statistically weaker effect, suggesting that formal financial access complements but does not determine UPI adoption.

4.2.2 Covariate Balance and Matching Quality

One-to-one nearest-neighbor matching with a 0.10 caliper was used after the estimation. Covariate balance was significantly improved by post-matching diagnostics:

- The **standardized mean difference (SMD)** for all covariates fell below **0.1**, satisfying common PSM quality thresholds.
- The common support assumption was validated by visual inspection of the propensity score distributions, which showed significant overlap between the treated (UPI users) and control (non-users) groups.

This ensured that the subsequent estimation of treatment effects was not driven by systematic observable differences between adopters and non-adopters.

4.3 Estimation of Average Treatment Effect on the Treated (ATT)

After **matching pairs** were obtained, the **Average Treatment Effect on the Treated (ATT)** was calculated as the difference in mean revenues between UPI adopters and their matched non-adopters:

$$ATT = E(Revenue\_UPI = 1) - E(RevenueMatched\_Non{-}UPI)$$

The estimated ATT showed that UPI users made, on average, **₹1,900 more per day** than their matched non-user counterparts. The effect was statistically significant at the **5% level**, confirming that UPI adoption has a positive and **economically meaningful impact on vendor-level income.**

Subgroup Heterogeneity

Further heterogeneity analysis revealed nuanced effects across vendor characteristics:

Subgroup	Estimated ATT	Interpretation
Urban Vendors	+₹2,200/day	Digital adoption more effective in digitally mature markets
Semi-Urban Vendors	+₹1,100/day	Benefits present but constrained by network and literacy gaps
Educated Vendors Secondary	≥+₹2,400/day	Strong complementarities between education and digital adoption
Food & Retail Vendors	Highest ATT	Frequent transactions magnify digital payment efficiency gains

These findings align with the hypothesis that UPI adoption enhances operational efficiency by reducing transaction frictions, increasing customer turnover, and enabling smoother change management — particularly in high-volume markets.

4.4 Robustness Check: OLS Regression Analysis

To validate the PSM estimates and rule out specification dependence, an **Ordinary Least Squares (OLS)** regression was estimated on the full sample as:

$$Revenue_i = \alpha + \delta UPI_i + \gamma 1 Edu_i + \gamma 2 Years_i + \gamma 3 MarketType_i + \gamma 4 Age_i + \gamma 5 Gender_i + \gamma 6 Smartphone_i + \gamma 7 CreditAccess_i + \varepsilon$$

OLS Results

- The coefficient on **UPI usage** ($\delta = 2498$) was **positive and statistically significant** ($p < 0.05$), corroborating the PSM results.

- The R2 value of 0.28, which is moderate for cross-sectional field data, shows that UPI adoption and other covariates account for 28% of the variance in daily revenue.

- Other significant and positive control variables included education, smartphone ownership, and urban market presence.

- Once UPI use was taken into account, gender and credit access were statistically insignificant, but age showed a slight negative correlation.

- Age displayed a mild negative relationship, while gender and credit access were statistically insignificant once UPI use was controlled for.

The conclusion that UPI adoption causally raises vendor-level earnings is strengthened by the consistency of the ATT and OLS coefficients.

4.5 Qualitative Evidence and Behavioral Insights

The qualitative element aids in interpreting the reasons behind the emergence of these effects, while the econometric analysis offers quantitative validation.

- The useful advantages of UPI were highlighted by a number of vendors during field visits: "Now I don't have to worry about change; customers pay exact amounts," said one Dilli Haat vendor.
- Others reported that UPI improved **customer retention**, as many younger customers prefer cashless transactions.
- Additionally, vendors stated that it was simpler to track daily income and establish informal creditworthiness when transactions were recorded.

The interviews did, however, also reveal enduring behavioral and trust-related obstacles:

- Several vendors in markets like Loni and Najafgarh reported receiving phony payment confirmations or delayed settlements; some linked digital payments to government tracking or tax scrutiny, indicating a pervasive reluctance to formalize.
- Older vendors particularly expressed anxiety about **technical failures**, often preferring “cash because it cannot go wrong.”

These narratives reveal that even when infrastructure is available, adoption decisions are shaped by psychological and social factors — consistent with behavioral models of financial inclusion that emphasize *trust, literacy, and perceived control* as key determinants of digital uptake.

4.6 Summary of Empirical Findings

Parameter	Value / Observation	Interpretation
UPI Adoption Rate	79.3%	High adoption overall; spatial and demographic disparities remain
ATT Estimate	+₹1,900/day	Significant revenue gain from digital adoption
OLS Coefficient (δ)	+₹2,498	Confirms PSM result; consistent magnitude
R^2 (OLS Model)	0.28	Moderate explanatory power typical for cross-sectional data
Key Positive Predictors	Education, smartphone ownership, urban location	Structural and capability enablers
Major Barriers	Fraud fears, poor connectivity, POS device cost	Persistent non-infrastructural resistance

4.7 Interpretation and Policy Linkage

The results of this study offer compelling empirical proof that the adoption of digital payments, particularly through UPI, has a statistically significant and economically significant impact on the daily earnings of street vendors in Delhi-NCR. Ordinary Least Squares (OLS) and Propensity Score Matching (PSM) estimates agree that vendors who used UPI made between **₹1,900** and **₹2,498** more per day than similar non-adopters. In the informal sector, where average daily earnings are usually modest and margins are narrow, this improvement is significant.

Economically speaking, the effect that has been observed can be understood as an increase in productivity and efficiency brought about by digital inclusion. By catering to tech-savvy customers, UPI expands the customer base while lowering transaction frictions like time spent handling cash, giving change, and recording sales. The ease and speed of UPI transactions directly translate into more sales per unit of time for many vendors, particularly in urban markets with high foot traffic, increasing effective labor productivity.

Structural Drivers and Behavioral Dimensions

Additionally, the analysis showed that the advantages of digital adoption are strongly conditioned by structural factors, including location, smartphone ownership, and education. Higher educated vendors are more adept at navigating mobile applications, resolving transaction problems, and fostering consumer confidence in electronic payments. In a similar vein, smartphone ownership serves as a gateway variable; without dependable personal devices, vendors are unlikely to fully realize efficiency gains and are still reliant on others for digital transactions. These effects are further enhanced by location. Urban markets generate network externalities that increase UPI's profitability because of their more robust digital ecosystems and more familiar consumers. However, semi-urban areas are subject to social (e.g., peer influence, limited digital trust) and infrastructure (e.g., network reliability) constraints, which results in partial diffusion and smaller average treatment effects.

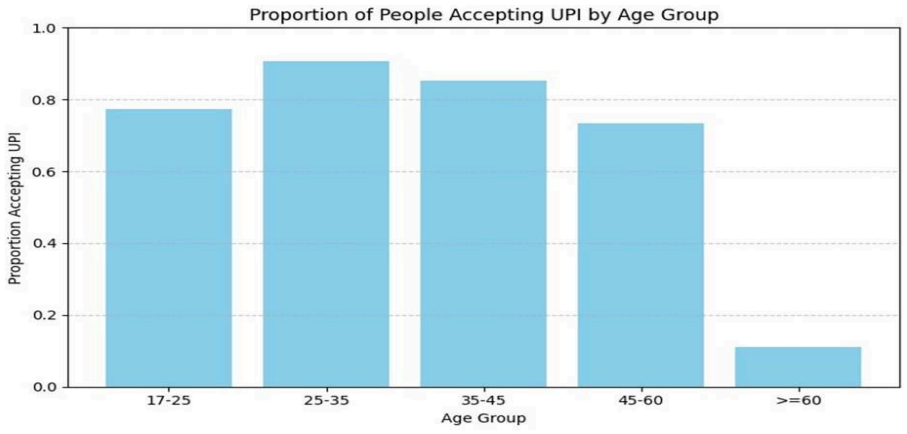
The behavioral component is still crucial even after accounting for these observable elements. According to field interviews, adoption decisions are heavily influenced by perceived control and trust. Sometimes, even tech-savvy vendors steer clear of UPI out of concern for fraud or government scrutiny. Infrastructure alone won't be enough to overcome this behavioral inertia; focused interventions are needed to boost informal entrepreneurs' financial confidence.

5. Findings and Discussion

This section presents the key findings from the qualitative and quantitative analysis of data collected during the survey. The UPI adoption rate in our survey, with a sample size of 188, is 79.3%. Segmentation between urban and semi-urban takes the rate to 82% in the urban category and 66% for semi-urban, thus showing that there is relatively low adoption in the semi-urban markets. Out of the 20 markets visited, 80%, which is 16 markets, were urban and the rest, 4 markets, were semi-urban. A possible reason for this could be low digital penetration in these areas.

When we divide on the basis of age group, we could find that older vendors are comparatively using less UPI, and the reason for this was mostly because of resistance to change and their lack of technical knowledge required to accept UPI. Now the middle-aged group of vendors has a high acceptance rate, while for the 17-25 age group, which is the youngest in our dataset, the acceptance rate is lower than that of the middle-aged group. It can be noticed that when we asked them the reasons for not accepting UPI, one of them replied it was due to not having a PAN card that is required to have a bank account. He had taken help from his brother whenever someone wanted to pay him via UPI. In another case, one vendor replied that he is only helping his father; his father accepts UPI, and whenever anyone requests UPI payment, he accepts it via his father's UPI.

Figure 1

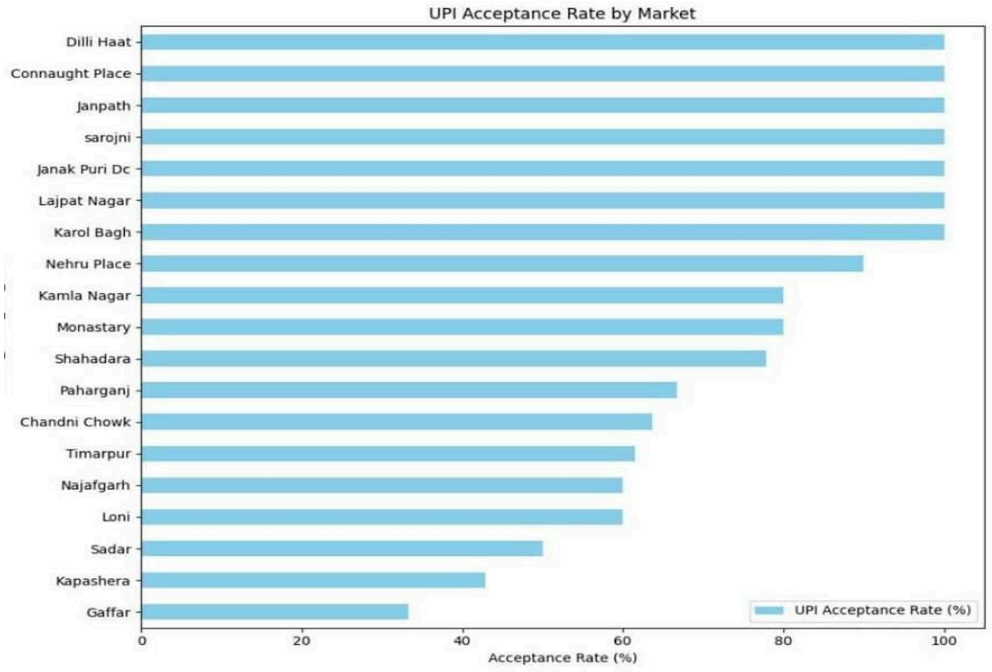


Dividing vendors on the basis of gender, the acceptance rate of UPI among women was 55%; for men, this is around 80%. Around 50% of these women gave illiteracy as a reason for not accepting UPI.

The variation in the acceptance of UPI across different street markets of Delhi and the National Capital Region was quite evident from this survey. In urban markets such as Dilli Haat, Connaught Place, Janpath, and Sarojini Nagar, UPI acceptance is highest, almost touching full acceptance. These have higher customer footfall, better internet connectivity, and exposure to digitally aware consumers,

Even within urban markets, acceptance varies; Gaffar and Sadar show comparatively lower digital use. At the same time, semi-urban markets such as Shahadara, Najafgarh, Loni Market, and Kapashera showed comparatively lower acceptance levels, ranging between 40% and 70%. The relatively lower rates in these markets can be attributed to limited digital literacy, inconsistent internet access, and a stronger preference for cash-based transactions among both vendors and customers.

Figure 2

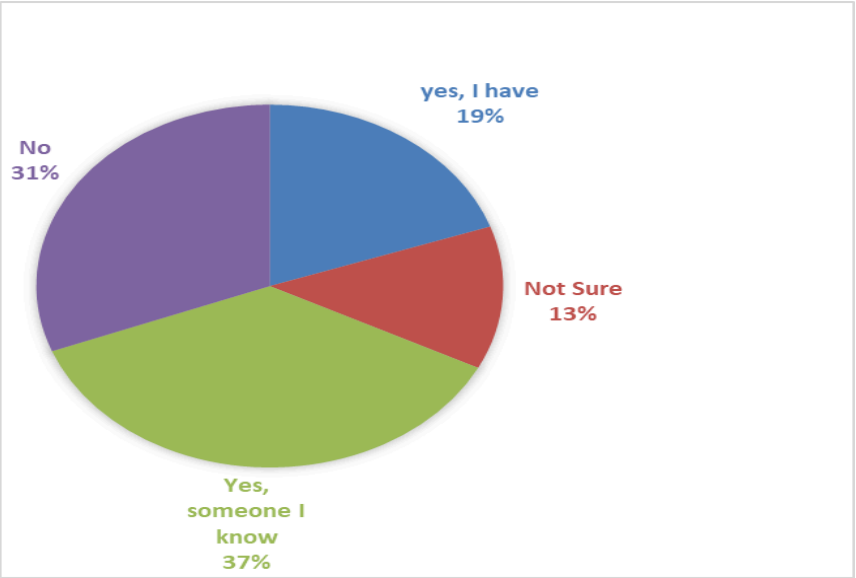


5.1 Fraud Concerns

One of the vendors shared a distressing experience during the interview. He explained that when he first started accepting digital payments, a person had helped him set up his UPI account, but the account was actually linked to that person's own bank account. For almost two years, every time the vendor received an online payment, he would get an SMS notification and assume the money had reached him, unaware that all the payments were being diverted to the fraudster's account. It was only after two years that he discovered he had been scammed, losing all his online earnings during that period.

Another vendor selling electronic accessories in Nehru Place says a customer once convinced him that he was making an online payment for earphones worth ₹1,200. The retailer says the customer flashed a false acknowledgement slip, and only later did he find that the amount was never credited to his account.

Figure 3:- Responses of vendors when we ask them if they have faced any Fraud.



5.2 Barriers

Even though digital payments are growing quickly in India, there are still some issues that keep street sellers in Delhi and the NCR from fully adopting UPI. These barriers can be grouped into four main categories:

5.2.1 Awareness and Behavioral Barriers

Low levels of digital and financial literacy, particularly among vendors operating in semi-urban areas, emerged as a major obstacle. Older vendors often reported discomfort with using smartphones and navigating payment applications. There was also a habit-driven resistance: many vendors, nearly 40% in fact, prefer cash transactions because they are so used to the informal cash economy and cash ensures faster, hassle-free transactions without digital dependence. Wholesalers from whom they mostly purchase goods take only cash for payment; hence, they prefer cash. Variations based on gender and age were also recorded: the female vendors, the youngest below 25 years, and oldest age groups above 55 years revealed lower UPI acceptance rates, which indicated the gap in awareness, confidence, and exposure to digital systems. This also reflects the dominance of certain groups; by preventing the empowerment of others, they maintain control and preserve their influence.

5.2.2 Technological Barriers

Technological barriers still stand in the way of digital payment adoption among street vendors. Issues like network connectivity issues regularly occur at most semi-urban markets like Kapashera, Loni, Najafgarh, and Shahdara that result in delays or sometimes failures of transactions. Most vendors, especially those in the older age brackets,lack access to smartphones, device maintenance, and application usability of digital payment systems. Low digital literacy, worry about technical glitches, and the absence of immediate local support further deter adoption. Thus, these technological constraints are holding back vendors from fully availing themselves of the convenience and safety that comes with a digital payment system.

5.2.3 Trust and Security Barriers

Vendors are still suspicious of UPI and any other digital forms of making and receiving payments. Many vendors fear online fraud, such as unauthorized transactions, phishing attempts, and fake payment receipts, or customers disputing the non-receipt or reversal of transactions. Several respondents reported cases where customers showed them fake screenshots or made false claims of transaction failure, further instilling a sense of mistrust about the dependability and transparency of the digital system. Vendors do not only distrust the digital system of payments; most of them also stay away from formal financial institutions. This means that they avoid taking credit or banking services from formal mechanisms; they prefer informal sources of credit, and hence take loans from acquaintances, local moneylenders, or other community-based arrangements, over institutional loans, further limiting their access to secure and regulated financial services.

5.2.4 Financial and Institutional Barriers

Several respondents identified the cost of UPI-enabled payment devices such as QR stands, POS terminals, or Android-based payment systems as a barrier to digital payment adoption. Market data supported these perceptions, indicating that the cost of basic POS terminals in India typically ranges from ₹8,000 to ₹12,000, while advanced multi-functional systems integrated with billing, inventory, and connectivity features may range between ₹15,000 and ₹50,000, depending on the configuration and service provider. While some financial institutions and some payment service providers have rental models or partial subsidization of costs, vendors also bear regular costs for device maintenance, software updates, and data connectivity. For micro and small-scale vendors with narrow margins and lower volumes of transactions, these initial and recurrent costs serve as significant economic deterrents. The financial burden hence imposed by digital infrastructure contributes to continued reliance on cash-based transactions and slows the wider transition toward a cashless economy.

6. Policy Recommendations

This study's findings show that UPI adoption is significantly associated positively with daily earnings among the street vendors, majorly in urban areas where vendors are qualified with better education levels. We are currently facing a dual challenge: resistance to behavioral change and a lack of necessary infrastructure. To overcome this, a cohesive strategy is required, one that prioritizes both empowering individuals with essential competencies and building confidence in the overall approach. My recommendations are as follows:

6.1 Digital Literacy and Capacity Building

To address the significant gap in digital literacy among street vendors, we need a mandatory, practical training and awareness program right across the market. The training should be hands-on and realistic, featuring: live demonstrations, workshops in local languages, and a peer-to-peer teaching approach that will build trust and make it more effective. The main things they need to learn are key skills: how to use UPI confidently, how to spot and avoid digital fraud, and basic fixes for technical problems. This essential training must happen before we offer any incentives for adopting the technology.

6.2 Incentivization for Digital Adoption Among Vendors

We can reduce financial hurdles to support vendor uptake of digital payment measures. Short-term incentives could play a role. For example, we could offer short-term waiving of certain transaction fees, a one-time bonus to vendors for onboarding, and possibly micro-loans for small equipment purchases such as smartphones or QR devices. All of these incentives would help vendors to adopt digital transactions into their business operations.

6.3 Build Trust with Digital Safety, Proactive Fraud Awareness and Fast Grievance Redressal

To build trust and maintain trust, we can provide regular digital safety awareness campaigns. Establishing an accessible helpline specifically for vendors would also help build trust in the system, as would create an accessible procedure to address complaints. All of these activities create trust and trustworthiness by addressing issues upfront. Most importantly, this would provide assurance for quick resolution and response around any problems related to fraud or technology problems to build trust in a digital ecosystem.

6.4 Infrastructure

We can continue to build the connectivity and reliability of digital transactions, especially in semi-urban and rural areas. Collaboration from government, telecommunications, and fintech could assist in affording creating stable, secure payment infrastructure for unverifiable vendors.

6.5 Incentives for Consumer

Reward points, cashback offers, or small discounts can strongly encourage users to use UPI, which will help spur demand. As more users begin selecting to transfer payments digitally, vendors will be prompted to adopt digital payment options and maintain digital offerings in order to remain relevant.
Improved Technology and Internet Access
We need reliable access to the internet and payment transactions, especially when it comes to small towns and in local markets. Internet service providers, mobile network operators, and digital payment companies must partner to establish a reliable, low-cost, and secure payments ecosystem for street vendors.

6.6 Incentives for Consumers to Shop

We need to incentivize customers to make digital payments. If consumers receive additional bonus points or cashback, similar to in-store customers shopping with rewards points, or discounts for using UPI, digital payments would become much more appealing. If customers elect to shop with digital payments, it is only natural that vendors will continue to offer digital payments to remain relevant.

7. Limitations and Future Scope

7.1 Limitations

There are a number of limitations to take into account when reading the findings of this study. First, there is a reliance on a relatively small number of street vendors, 188 vendors to be precise situated in Delhi and the National Capital Region (NCR). Although the sample was taken from different product categories and market types, the findings generated from the study are restricted to the area included in the sample. Smaller towns, and rural areas, may operate with significant differences in infrastructure or consumer behaviour. Although the study represents the direct users of UPI, individuals living in poverty often access UPI not for their own transactions, but by asking family and

nearby stallholders to make the transaction. This active participation by others may skew the overall representation of digital participation in informal markets, where shared devices (between household members), and proxy transactions (through relatives or stallholders) are often the norm.

Another limitation of this study is the cross - sectional nature of the research. The research was conducted as a snapshot of vendor behaviour and revenue patterns, without capturing how adoption, trust and usage change over time or over an economic season. Relying on self-reported data can also present a limitation. Vendors may have either over- or under-reported their income or transaction volume, due to memory recall, or due to privacy concerns. Finally, the analysis is primarily focused on UPI and does not consider other code-based digital payments, such as Paytm or PhonePe. If various digital payment platforms would be included in future studies then it would give a broader picture of the digital payment landscape to the small vendors.

7.2 Future Scope

Future research could address these limitations by expanding the geographical reach to include multiple states and both urban and rural markets. This approach would allow for comparisons across different socio-economic and infrastructural contexts. Long-term studies that track vendors over time would offer deeper insights into the durability of digital adoption and its effects on income, customer reach, and business resilience. Researchers could also use randomized control trials (RCTs) or quasi-experimental designs to provide stronger evidence on how UPI adoption affects vendor performance.

Additionally, future studies should look at indirect and shared uses of UPI within social and community networks. This would clarify the collective and collaborative aspects of digital inclusion in informal economies. Evaluating the impact of policy initiatives and digital literacy programs, like PM-SVANidhi and Digital India, could show how public efforts encourage adoption. Combining quantitative surveys with qualitative interviews or ethnographic methods would further improve the understanding of the experiences and adaptive strategies of street vendors navigating India’s changing digital payment landscape.

8. Conclusion

This study investigates the adoption of UPI by street vendors in Delhi and NCR, examining usage patterns, drivers, barriers and consequences of digital payment usage within India's informal economy. This study was based on a mixed-methods research design, combining quantitative study with qualitative field insights. Empirical results from Propensity Score Matching and Ordinary Least Squares regression supported our hypothesis that UPI adopters earn significantly higher average daily

revenues, ranging between ₹1,900 and ₹2,498, compared to matched non-adopters. This premium is accountable to increase in efficiency, convenience, and the possibility of business growth due to digital transactions. UPI adoption has helped suppliers to work effectively, they no longer need to deal with cash, giving out change, and maintaining better records. UPI has the potential to deal with more customers in much less time, thereby improving turnover and productivity. Quantitative results have been found to be the highest among the categories of urban vendors, educated people, and people using smartphones, demonstrating the strong linkage between digital capability and economic gains.

The study brings out a digital gap. Among urban markets such as Connaught Place, Janpath, and Dilli Haat UPI adoption rate was close to 100%, but in semi urban markets like Loni, Najafgarh, and Shahdara it was comparatively low because of poor connectivity, low digital literacy, and lack of digital Infrastructure. The gender gap remains significant, with male vendors around 80% adopting UPI while for female vendors it was around 55%, the key barriers for many of them were illiteracy and technical hesitation. These were complemented by strong behavioral resistance to adopt new techniques among older vendors, often based on habit and fear of technology; for younger vendors the main barriers are lack of identification documents or personal bank accounts.

During field interviews we got to know about fraud cases like vendors receiving fake payment confirmations from customers, fraudulent account setups, and diverted transfers. These incidents point to an urgent need for stronger consumer protection frameworks, training of vendors on digital verification practices, and an institution dedicated to their safety. The analysis thus points to a dual challenge: bridging infrastructural gaps and addressing behavioral inertia. Policy interventions must therefore be multidimensional.

Despite its rich findings, the study acknowledges that it has some limitations in terms of sample size, geographic concentration, and the reliance on self-reported data. This calls for future research to expand to other geographies and employ longitudinal or experimental designs that better capture the evolving dynamics of digital behavior and income effects over time. This might also involve indirect or shared UPI usage among families or communities to bring out the collective dimensions of digital inclusion.

In conclusion, the adoption of UPI among street vendors represents a vital step toward financial empowerment, operational efficiency, and economic resilience. Its full potential will be realized only when technological access is matched by trust, literacy, and institutional support. A comprehensive approach that incorporates infrastructure, education, and safety measures will enable one of the most vibrant sectors of the informal economy of India, street vendors, to engage confidently and fully in the nation's process of digital transformation.

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