

ESSAYS ON TRANSACTION TECHNOLOGY AND PAYMENT SYSTEM

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The present thesis investigates several aspects of the digital transaction, the transaction without the involvement of currency notes and coins. Since digital payment systems enjoy two clear advantages over cash-based or paper-based non-cash payment systems. First, since most electronic payments cost only around one-third to one-half as much as paper-based non-cash payments (such as cheque payments), shifting to electronic modes should considerably reduce the economic cost of the payment system. Secondly, under cashless transactions, the documentation of each transaction is complete and accurate compared to cash transactions, reducing the possibility of creating black money and increasing transparency and tax compliance. Starting from 2016, the promotion of cashless transactions has been one of the policy priorities of the Government of India. The present thesis focuses on three broad issues that either have not been addressed in the existing literature or have been investigated only to a limited extent using different methodology. Three distinct empirical as well as theoretical models have been developed to address three research questions that to the best of our knowledge, are not examined before: first, the extent of the digital cashless transaction in Indian economy over time and how the some policies and events affects the trend of the cashless transaction of the economy; second, the thesis attempts to theoretically establish a relationship between income, education and cashless transaction; the thesis also seeks empirical validation of the theory and focuses on the role of other socio economic factors behind the usage of the cashless transaction.

There are three core chapters of the thesis chapter 3: Index of Cashless Transaction , chapter 4: Determinants of Digital Transaction: A Theoretical Approach, and chapter 5: Determinants of Digital Transaction: An Empirical Analysis, finally chapter 6 concludes.

In the 3rd chapter of the thesis measures the extent of cashless transactions in the Indian economy over time (from 2012 – 2023), the main focus on assessing the impact of two major

policy interventions (PMJDY and demonetization) on the growth of both the volume and value of different types of cashless transactions of the Indian economy. Additionally, the aim is to understand the current state of cashless transactions in the Indian economy post COVID-19 pandemic and determine whether there has been a significant shift towards a cashless economy after the outbreak of COVID-19 pandemic. It is one of the policy priority of the government of India to promote financial services and cashless transactions, starting with the PMJDY in 2014. Though the significance of cashless transactions is acknowledged, a proper measuring stick is needed to gauge the degree and efficiency of the policies for promoting cashless transactions in an economy, this work is inadequate in the literature given the importance of this issue. In the 3rd chapter, we endeavour to fill this gap by utilizing the multi-dimensional index formulated by the UNDP. Chapter 3 concludes that both demonetization and the COVID-19 pandemic have a positive effect on the per capita value index of the cashless transactions for the Indian economy. The per capita volume index experienced a positive trend break post-demonetization period, but this trend persisted till before the COVID-19 pandemic. However, the COVID-19 pandemic hurt the trend of the per capita volume index, as a result, the trend reverted to the pre-demonetization stage. This reveals the fact that during the COVID-19 pandemic, people are using cashless modes of payment for higher-valued transactions than before, but it is possibly not the case more people have started using cashless transactions than before. The government should emphasize more on the policies, which promote financial inclusion rather than the policies which increase the value of cashless transactions. Demonetization doesn't have any impact on the value-GDP index. The COVID-19 pandemic has had a temporary negative effect on the value-GDP index, which is possibly a result of the economic downturn due to the pandemic. But the negative effect didn't persist, it came back to the previous trend by the end of 2022, indicating economic recovery as well as an increment in the overall value of the cashless mode of transaction. The types of cashless transactions

where both demonetization and the COVID-19 pandemic have positive effect are the Per capita volume of IMPS, Per capita value of IMPS and Value of IMPS/ GDP transactions. In the case of all three measures of POS transactions, demonetization has a positive impact, but after the outbreak of COVID-19 that positive shift turned into a negative effect, which implies that after the outbreak of the COVID-19 pandemic and lockdown measures buyers didn't prefer to use debit and credit cards to make payments. The types of cashless transactions where demonetization has no impact are No. Of Cards per 1000 Adults, Per Capita volume of NEFT, the value of NEFT/ GDP, Per Capita Value of RTGS, the value of RTGS/ GDP, the value of ECS+NACH/ GDP. The types of cashless transactions where only the COVID-19 pandemic has a positive impact are per capita volume as well as the value of IMPS, Value of IMPS/ GDP, per capita volume of NEFT and per capita volume of RTGS. This indicates an increase in total volume of online transfer of funds. The type of cashless transaction where the COVID-19 pandemic has a negative impact is No. Of Cards/ 1000 Adults, per capita volume and value of POS, per capita volume of ECS+NACH, per capita value of NEFT, per capita value of RTGS, POS/ GDP, NEFT/ GDP and Value of RTGS/ GDP. This may indicate that there has been a shift in the preference across different forms of online fund transfers. More specifically ease of IMPS transactions may have resulted in a substitution of NEFT and RTGS transactions by IMPS transactions. The decline in per capita volume and value of POS may also indicate a substitution of card transaction by UPI based transactions , which we could not investigate due to paucity of time series data.

In the 4th chapter of the thesis we analyse how the socio-economic conditions mainly education level and income level of the buyer impact the selection of cashless payment methods. For this purpose a theoretical framework is developed focused on modelling the transaction costs of both cash and cashless transactions (debit card) separately from the buyer's perspective corresponding to the different education level and income level. By comparing the transaction

cost structures the main objective is to find out the combination of education and income levels where the cashless transaction will be used, in an environment where debit cards and currency (legal tender) are competing payment channels. It explores the impact of education and income on the selection of payment modes between cash and cashless transactions by examining changes in transaction costs of cash transactions and cashless transactions across different income and education levels with and without the presence of direct taxation. The analysis is carried out in two stages: without any taxation and in the presence of direct taxation. Chapter 4 concludes that in the absence of income tax, a critical threshold of education level exists, beyond which buyers prefer cashless transactions, conditional upon the representative buyer already having a threshold level of income or beyond. On the other hand, a critical threshold level of income exists beyond which representative buyer will prefer cashless transactions but again conditional upon the buyer already having a threshold level of education or beyond. This underlines the joint influence of education and income behind the selection of a particular payment mode. However, when income tax is introduced, the study identifies the combination of a threshold level of income and threshold tax rate that determine the advantageous choice between maintaining all of the income of the representative individual either in white money form and doing the cashless transaction using debit cards or in black money form and doing the cash transaction. The combination of a tax rate and income exceeding a certain threshold prompts a shift towards maintaining all of the representative buyer's income in black money form for cash transactions. On the other side, a combination of higher levels of income and lower tax rates, favour cashless transactions with 100% white money. The research also identifies an optimal proportion of income understatement that maximizes the net benefit from transactions. This optimal proportion is influenced by factors such as income level, tax rates, probability of detection, and penalty charges.

The main objective of the 5th chapter is to find empirical validation for the theory developed in the 4th chapter of the present thesis. In the process we also investigate the socio economic determinants of use of the cashless transaction through a comprehensive statistical analysis of data, taking into account the intricate interplay between various socio economic variables in influencing cashless transaction usage. Especially interaction term between different socio economic variable has been implemented to unveil the joint effect of the variables on the likelihood of possessing cashless transaction, such that the effect of level of education behind the selection of cashless mode of payment is depend on the level of income the household holds or not and weather the effect of level of income behind the selection of cashless mode of payment is depend on the level of education the household holds or not. Besides the education and income level the analysis also consider the other five socio economics variables in the analysis those are age, household status, financial inclusion status, computer knowledge and access and economic class, to find out the effects of these variables behind the selection of cashless mode of payment. The analysis has been done for the two time period one is for 2011-12 and another is for 2004-05. A significantly positive value of the coefficients of the interaction terms in all the regression results (except for 2004-05) highlights the joint effect of income and education level on cashless transaction usage within a household. This complex relationship suggests that the effect of changes in income depends on the educational attainment of the household members, and the effect of changes in education level on the likelihood of selecting the cashless mode of payment, depends on the existing income level of the household, Very high level of income but zero education level doesn't have any effect on the likelihood of selecting the cashless mode of payment. In summary, these findings support the theoretical analysis of Chapter 4. Furthermore, logistics regression analysis for the years 2011-12 explores the effects of income, education, age, computer knowledge, financial inclusiveness, economic classes, and household statuses on cashless transaction usage. The

result emphasizes the importance of age, computer knowledge, financial inclusiveness, and economic class in shaping the likelihood of engaging in cashless transactions. The logistic regression results for the year 2004-05 are included in the appendix, as all the socio-economic coefficients are statistically insignificant in the year 2004-05. This could be the result of a lack of awareness about the digital transactions in the year of 2004-05.

The thesis brings up several important policy recommendations. The analysis in Chapter 3 shows that both demonetization and COVID-19 pandemic have positive impact on the per capita value index of the cashless transaction. Demonetization has positive impact on the per capita volume index of the cashless transaction, but after the outbreak of COVID-19 that positive impact was removed and per capita volume of the cashless transaction reverted back to the pre demonetization trend but during the end of 2023 there is a positive trend break again. This indicates during post COVID-19 pandemic people are using cashless modes of payment for higher-valued transactions than before, but it may not be the case that more people have started using cashless transactions than before. Govt. should emphasize more on the policies which promote financial inclusion rather than the policies which increase the value of cashless transactions. Demonetization doesn't have any impact on the value-GDP index. The COVID-19 pandemic has had a temporary negative impact on the value-GDP index, which is possibly a result of the economic downturn due to the pandemic. But the negative effect didn't persist, it came back to the previous trend by the end of 2022, indicating economic recovery as well as an increment in the overall value of the cashless mode of transaction. The only transaction where Covid-19 pandemic has positive impact on the all three measures is IMPS transaction and the only type of transaction where COVID-19 pandemic has negative impact on the all three measures is POS transaction, COVID-19 has also negative impact on the No. Of cards per 1000 adults, this result clearly indicates that post COVID-19 Indians more prefer contactless transactions, they don't prefer card transactions. Policy makers should emphasis

more on contactless type of cashless transactions than on the card transactions.

In the 4th chapter it is established that in the absence of income tax, a critical threshold of education level, beyond which buyers prefer cashless transactions, conditioning that the buyer already has a threshold level of income or beyond. On the other way a critical threshold level of income exists beyond which buyer will prefer cashless transaction but conditioning that buyer already has a threshold level of education or beyond. This underlines the joint influence of education and income behind selection of a particular payment mode. To promote cashless transactions, the government should prioritize efforts to elevate both education levels along with the income level rather than merely focusing on income augmentation. However, when income tax is introduced, the analysis unveils critical insights into the payment mode choices between cash and cashless transactions, taking into account the complex interplay of tax evasion, income understatement, and transaction costs. The study identifies the combination of a threshold level of income and a threshold tax rates that determine the advantageous choice between maintaining all of one's income either in the form of white money or in the form of black money. Beyond these thresholds, individuals are influenced to adopt specific payment modes so that their net benefit from transaction could be optimised. Tax rates play an important role in shaping individual preferences for payment modes. Combination of a tax rate and income exceeding a certain threshold prompts a shift towards maintaining all of his income in the form of black money for cash transactions. On the other hand , combination of higher level of income and lower tax rates, favour cashless transactions with white money. The research identifies an optimal proportion of income understatement that maximizes the net benefit from transactions. This optimal proportion is influenced by factors such as income level, tax rates, probability of detection, and penalty charges. Policymakers should consider setting tax rates strategically to align with the thresholds identified in the study. Striking a balance that discourages tax evasion while promoting cashless transactions could enhance overall economic

efficiency. Strengthening measures for detecting income understatement and tax evasion, such as improving monitoring systems and employing advanced technologies, can deter individuals from keeping substantial black money. Policymakers may evaluate penalty rates to ensure that they are sufficiently deterrent yet not overly punitive. A judicious balance can discourage tax evasion while providing individuals with incentives to adopt cashless transactions. Public awareness campaigns and incentives for adopting cashless transactions, especially among those with higher education levels, can contribute to reducing the prevalence of black money and enhancing overall transaction efficiency. Given the significant impact of education on transaction costs, policymakers may consider educational initiatives to improve financial literacy and promote the benefits of cashless transactions, contributing to a more informed and efficient payment landscape. Furthermore, logistics regression analysis for the years 2011-12 explores the significant effects of age, computer knowledge, financial inclusiveness, economic classes, and household statuses on cashless transaction usage. The nuanced understanding derived from this study provides actionable guidance for policymakers aiming to optimize economic outcomes and foster a transition towards a more efficient, cashless economy.