Debit card and demand for cash☆

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ABSTRACT

Despite the growing importance of the debit card in most developed countries, there are relatively few academic studies that analyze the impact of such evolution on the demand for cash. Beyond data availability, this research is complicated by the fact that the debit card provides two services for consumers - cash withdrawal and payment - that have contrasting effects on cash holdings and cash usage. Using micro-level data, we estimate the impacts of both services on the demand for cash by comparing the cash holdings and cash usage of three populations, namely non-cardholders, ATM-only cardholders, and debit cardholders. Controlling for various individual and network characteristics as well as a possible endogeneity issue, we find that the negative effect of the payment service on the demand for cash dominates the positive effect of the cash withdrawal service resulting in an overall negative impact of the debit card on the demand for cash.

1. Introduction

Recent empirical research on the social cost of payments state that cash is the most costly payment instrument and that electronic ones such as debit card should be encouraged to reduce this cost (Schmiedel et al., 2012). To promote the use of debit cards, two main solutions have been considered. The first is based on a cost-related pricing of payment instruments. Since consumers do not generally face direct charges when deciding which payment instrument to use, Van Hove (2004) defends the view that there should be explicit fees, in part per-transaction, to provide information on the relative social costs of payment instruments. This solution has been implemented in Norway, for instance, to discourage the use of checks (Humphrey et al., 2001). The second solution consists of increasing the number of payment terminals at point of sale and/or limiting the number of Automated Teller Machines

(ATM) to raise the costs of cash withdrawals (Snellman and Viren, 2009).

The latter solution relies on the specificity of the debit card that provides two services - cash withdrawal and payment - although from a theoretical standpoint, the two services have mixed effects on cash holdings and cash usage. Indeed, on the one hand, the cash withdrawal function of a debit card allows a consumer to withdraw cash at ATMs at a lower cost and, following Baumol (1952), the lower the cost of a cash withdrawal, the lower the cash holdings of individuals. However, since the access to cash is facilitated, the usage cost of cash is reduced with respect to alternative payment instruments, which tends to increase in turn cash usage (Whitesell, 1989). On the other hand, the payment function of a debit card avoids the costs of cash holdings and usage and then tends to reduce the demand for cash. Given these mixed effects, the question that arises concerns the final impact of the debit card on an individual's cash holdings and cash usage.

Several studies have tried to measure the effects of the debit card on the demand for cash. However, because of the scarcity of individual data, empirical studies have mainly used aggregate data leading to contrasting results. For instance, the effect of the payment function on the demand for cash is either considered as negative (Markose and Loke, 2003; Snellman et al., 2001), null (Drehmann et al., 2002) or positive (Rinaldi, 2001). To the best of our knowledge, the only empirical study that uses individual data has been conducted by Stix (2004). The author finds that ATM usage is associated with 24% lower cash holdings and that users who pay frequently with their debit card hold about 12% less cash than

infrequent users for the same value of cash transactions. However, as the study does not focus on cash usage at point of sale, the impact of the debit card on cash usage cannot be examined.

This paper precisely focuses on the extensive margin of debit cards: what happens to cash payments if a consumer adopts a debit card? This question is worthy of investigation because, contrary to common belief, the adoption of the debit card is relatively 'low' in certain developed countries. For instance, in a recent cross-country study on cash and payment cards, Bagnall et al. (2016) report that only 76% of the US population holds a debit card; this proportion amounts to 83% for France and 85% for Austria. Beyond developed countries, it is also worth noting that the penetration of the debit card remains low in many other countries such as in Eastern and Central Europe (Beck and Brown, 2011), or in East Asia and Pacific, South Asia, etc. (Agarwal, 2015). The analysis of the extensive margin of debit cards is therefore highly relevant for a significant number of countries around the world.

To analyze the extensive margin of debit cards, we use a representative survey of 1370 French individuals conducted in 2005 during which we collected daily cash payments of three distinct populations: non-cardholders, ATM-only cardholders, and debit cardholders.[1] Non-cardholders can only withdraw cash from bank branches, whereas ATM-only cardholders can also withdraw cash at ATMs but cannot pay with the ATM card. Finally, debit cardholders can withdraw cash from bank branches and/or ATMs and can, additionally, pay directly with their debit card. Using two econometric methods and controlling for various individual and network characteristics as well as a possible endogeneity issue with a Bayesian Markov Chain Monte Carlo method, we find that i. ATM-only cardholders hold lower cash balances but use more cash in payments than non-cardholders; ii. debit cardholders hold not only lower cash balances but use less cash in payments than non-cardholders and ATM-only cardholders. More precisely, we find that the availability of the withdrawal function of the debit card has a positive impact on cash payments (between +11% and +21%) and a negative effect on cash withdrawals (between −37% and −29%), whereas the payment function has a negative incidence on both cash payments (between −61% and −52%) and cash withdrawals (around −30%). Overall, the net effect of the debit card is quite negative on cash usage (around -50%) and cash withdrawals (also around -50%).

This paper contributes to the payments literature in three dimensions. First, using individual-level data, this paper is the first to clearly estimate the impact of the withdrawal and payment functions of a debit card on cash holdings and cash usage. Second, this paper proposes an original estimation method by applying Bayesian econometrics that is new to the empirical payment literature. Many previous papers that use individual-level data have analyzed the effect of credit or debit cards on an outcome variable (demand for cash, usage of cash for payments). Typically, these models are treatment effect models where the decision to hold a card is endogenous. This paper estimates an endogenous ordered probit model that deals explicitly with the existence of a potential endogeneity issue if the type of population (non-cardholder, ATM-only cardholder or debit cardholder) is correlated with unobservable variables that influence cash holdings or cash usage. Finally, this paper adapts a well-known framework of payment instrument choice (Whitesell, 1989) to derive predictions about the effects of the adoption of debit cards.

The remainder of the paper is organized as follows. In Section 2, we review the payments literature on the effects of the debit card on the demand for cash. In Section 3, we describe the French payment market and the adoption of cards. In Section 4, we develop a model that analyzes the impacts of ATM and debit cards on cash holdings and cash usage. In Section 5, we introduce the data and in Section 6, we comment on the econometric specifications and the estimation results. Finally, in Section 7, we conclude and discuss the implications of the results.

2. Related literature

This section reviews the main theoretical and empirical findings on the impact of the debit card on the demand for cash.

2.1. Theoretical literature

Following the seminal paper of Baumol (1952) on the transaction demand for cash, Whitesell (1989) proposed an original approach to model the impact of the use of alternative payment instruments such as check or payment card on the demand for cash. According to Whitesell (1989), while cash holdings are subject to an interest opportunity cost, the use of cash is not subject to transaction costs (easy to use, etc.). However, the use of alternative payment instruments such as check or debit card involves fixed and variable costs in transactions. As a consequence, there is a trade-off for consumers between the opportunity cost of cash and the transaction costs for other payment instruments. Unless the opportunity cost of cash holdings is large, the author concludes that cash should be mostly used for small value transactions, i.e. where the opportunity cost is low compared with the fixed cost of other instruments. In other words, for Whitesell (1989), there is the size of a transaction, denoted λ, below which it is profitable to pay with cash.

Formally, Whitesell (1989) assumes that transactions are uniformly distributed over a continuous unit period. Let u denote the fixed cost of using a payment instrument and $v.T$ the variable cost v of a transaction size T (with $T \in]0; +\infty)$). The total cost of transacting a purchase of size T is then $u + vT$. If we denote $F(T)$ the value of spendings of size T, then the expected total cash payments are given by $S = \int_0^\lambda F(T)dT$. Let n be the number of cash withdrawals, then the size of each withdrawal is S/n and the average cash holdings equal $S/2n$. The consumer determines the number of withdrawals by minimizing the costs of withdrawals, nb (with b the cost of a single withdrawal), plus interest earnings foregone, $rS/2n$ (with r the interest rate). We can apply the same reasoning for the spendings on the interval $[\lambda; \infty)$. If $F(T)/T$ is the number of transactions in this interval, each having a transaction cost of $u + vT$, then the problem for a consumer is to choose λ and n to minimize:

$$nb + \frac{r}{2n} \cdot \int_0^\lambda F(T)dT + \int_\lambda^\infty F(T)\left[v + \frac{u}{T}\right]dT.$$

The first order conditions of this minimization problem with respect to n and λ are respectively:

$$b - \frac{rS(\lambda)}{2n^2} = 0, \tag{1}$$

and

$$\frac{rF(\lambda)}{2n} - F(\lambda)\left[v + \frac{u}{\lambda}\right] = 0. \tag{2}$$

Eq. (1) is the Baumol condition which states that the cost of cash withdrawal is just equal to the interest lost on the marginal cash withdrawal. Eq. (2) determines the level of substitution between cash and alternative payment instruments and shows that the lower the usage cost of an alternative payment instrument, the lower the use of cash (decreasing in λ).

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[1] This paper uses data from 2005. In light of ongoing changes (more card payments), this is a disadvantage. However, on the up-side, due to its sample size, this survey allows to find a significant number of consumers who do not hold debit and ATM cards and thus to identify the extensive margin.