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Constrained or unconstrained price for debit card payment?

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ABSTRACT

Retailers in the Netherlands and the U.K. can charge different prices for a commodity depending on whether cash or a debit card is used as payment, whereas retailers in the U.S. generally cannot. These two types of economies with and without a uniform pricing constraint for cash and debit card payments are compared in a microfounded monetary model. We place particular emphasis on the distinctive features of cash and debit cards as payment methods: the cost of a cash transaction for the seller is typically lower than that of a debit card, whereas the cost of cash holdings for the buyer is higher than that of a debit card. Our results suggest that a uniform pricing constraint makes cash-holding costs decline but consumption dispersion between the poor and the rich increase. Numerical examples show that the beneficial effect of the constraint dominates its negative effect.

1. Introduction

In the shift from paper-based to electronic transactions, the debit card has emerged as one of the primary means of payment. According to Borzekowski et al. (2008), debit card transactions have grown at an average rate of more than 20% per year since 1996. Schuh and Stavins (2012) report that debit cards made up the largest share of monthly payments in the 2008 Survey of Consumer Payment Choice.

The increased use of debit cards has drawn the attention of policymakers to the debit card industry. For instance, in October 2011, the Federal Reserve Board introduced Regulation II which placed a cap on the debit card interchange fee paid from a retailer's bank to a consumer's bank. This fee is of particular interest because it could be passed on to consumers via higher retail prices. Retailers in the U.S. are not typically allowed to impose a surcharge for purchases made using debit cards, hence they usually charge the same price for both cash and debit card payments.[1] Sellers are therefore likely to pass on debit card processing costs as higher prices for all consumers regardless of payment method, which then has regressive distributional implications. That is, in an economy where the poor typically use cash rather than debit cards, they will eventually subsidize the cost of debit card transactions, a payment method more commonly used by the rich.

This potential channeling of transaction costs through to consumers not involved in those transactions has sparked concern over the consequences for consumption and welfare, especially compared to economies such as the Netherlands and the U.K. where retailers can charge different prices contingent on the payment method used. In order to shed light on this issue,

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[1] Since January 2013, the retailers in 40 U.S. states have been permitted to apply a surcharge to credit card purchases ("checkout fee"), but they cannot impose it for purchases made using debit or prepaid cards.

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this paper compares an economy employing a uniform price constraint for cash and debit card payments (a constrained-price economy) with an economy not imposing the constraint (an unconstrained-price economy).

Most industrial organization literature that addresses these two economies focuses on the characteristics of the payment industry, including demand elasticities for payment services, competitions among sellers and among payment-service providers, and externalities attributed to payment networks.[2] Rather than revisiting these issues, we focus on the payments policy question: whether or not government should allow retailers to charge different prices across cash and debit card transactions. Put differently, industrial organization does not enter into our analysis. Instead, we make comparisons between the two ideal systems, one where price uniformity is enforced and the other where it is not. In doing so, we place particular emphasis on the distinctive features of cash and debit cards as payment methods: the cost of a cash transaction for the seller is typically lower than that of a debit card, whereas the cost of cash holdings for the buyer is usually higher than that of a debit card due to the inconvenience of carrying cash around and the risk of loss or theft (for more discussion, see Humphrey, 2004, He et al., 2008, and Monnet and Roberds, 2008).

Our main results are as follows. We first show that if the transaction cost of a debit card is neither too large nor too small and agents are sufficiently patient, there are equilibria wherein the poor use cash and the rich use debit cards in a constrained-price economy, whereas the poor use cash and the rich use both cash and debit cards in an unconstrained-price economy. We pay keen attention to these equilibria because their properties are plausible enough in the following senses. First of all, they suggest that the proportion of debit card transactions in a constrained-price economy is higher than in an unconstrained-price economy, which is consistent with the empirical observations of Bolt et al. (2010). In addition, because cash users (the poor) in a constrained-price economy eventually share the transaction cost of debit cards, consumption by the rich (debit-card users) is larger in a constrained-price economy than in an unconstrained-price economy, whereas consumption by the poor is larger in an unconstrained-price economy than in a constrained-price economy. This essentially conforms to the results of Carlton and Frankel (1995), Schwartz and Vincent (2006), and Schuh et al. (2010).

We then compare the welfare inherent in the constrained-price and the unconstrained-price equilibria, where welfare is defined as the lifetime expected discounted utility of a representative agent. Since the terms of trade for cash payments are more favorable than those for debit card payments in an unconstrained-price economy, an agent in an unconstrained-price economy is willing to hold more cash than in a constrained-price economy. Hence the cost incurred due to cash holdings is higher in an unconstrained-price economy than in a constrained-price economy. On the other hand, the consumption dispersion increases in a constrained-price economy compared to an unconstrained-price economy because in a constrained-price economy, consumption by the poor is relatively small and consumption by the rich is relatively large. These, together with a concave utility function, imply that the overall welfare ranking of the two economies relies on the relative magnitude of the cost-saving effect of holding cash in a constrained-price economy and the consumption-smoothing effect in an unconstrained-price economy. Using a wider range of parameter values, we do some numerical exercises. In every case considered, the cost-saving effect of holding cash in a constrained-price economy dominates the consumption-smoothing effect in an unconstrained-price economy. This provides support for uniform pricing across cash and debit card payments.

The paper proceeds as follows. Section 2 describes the model economy, followed by equilibrium characterization in Section 3. Section 4 compares a constrained-price equilibrium with an unconstrained-price equilibrium. Section 5 discusses the implications of the model on the welfare cost of inflation and Section 6 summarizes the paper with a few concluding remarks. Appendix contains the proofs of the analytical results and the details of the numerical results.

2. Model

The background environment is that of Lagos and Wright (2005) with competitive markets as in Berentsen et al. (2005).[3] Time is discrete and the horizon is infinite. There is a $[0,1]$ continuum of infinitely-lived agents with one perishable and divisible good which can potentially be produced and consumed by all agents. There is also an intrinsically useless, divisible and durable object called money. Each agent is endowed with $M > 0$ units of money at the beginning of the initial period. In each period, agents trade in three Walrasian markets, called market 1, 2, and 3, which open and close sequentially.

The sequence of events in a typical period is as follows. When entering market 1 with a given amount of money, an agent becomes either a buyer with probability $\rho_b > 0$ or a seller with probability $\rho_s = (1 - \rho_b) > 0$. As a buyer, an agent obtains utility $u(q)$ from consuming $q \in \mathbb{R}_+$ units of good where $u'' < 0 < u'$, $u'(\infty) = 0$, $u(0) = 0$, and $u'(0) = \infty$. As a seller, an agent suffers disutility q from producing $q \in \mathbb{R}_+$ units of good.

With the money balance after trading in market 1, agents move on to market 2 where each agent again receives an idiosyncratic trading shock so that she will become either a buyer or a seller with equal probability. After the realization of the preference shock for market 2, the government has access to intra-market record-keeping technology and begins to provide a checkable deposit service. Each agent then chooses a portfolio $\boldsymbol{\omega} = (c, d) \in \mathbb{R}_+^2$ where c and d denote cash holdings and checkable deposits respectively. An agent holding cash incurs disutility $\varphi \in (0,1)$ for each unit of real cash balance. This disutility

[2] More details, see Hunt (2003), Rochet and Tirole (2004, 2006), Bolt et al. (2010), and Chakravorti (2010).

[3] Related competitive pricing models in the Lagos–Wright framework include Rocheteau and Wright (2005), Lagos and Rocheteau (2005), and Berentsen et al. (2007).