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Consumer Use of Multiple Payment Methods

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Abstract: The paper investigates the degree to which buyers choose to diversify their use of payment methods for in-person purchases. Some buyers use only one payment instrument. Others combine the use of mostly cash, credit, debit cards, and a few paper checks and prepaid cards. To each survey respondent, I apply three concentration measures over the use of payment instruments. Results show that the degree of consumers' payment concentration exhibits almost no correlation with consumer demographics, payment volume, or aggregate value.

JEL classification: D9, E42

Key words: multiple payment methods, consumer payment choice, payment instruments, in-person purchases, concentration measures

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1. Introduction

Data on consumer payment choice show that more than 70 percent of U.S. consumers carry the following payment instruments: cash, credit cards, debit cards, and paper checks, and over 50 percent own a prepaid card, see Figure 2 in Greene and Stavins (2018a) . Moreover, consumers tend to own duplicates of the same payment instrument, for example the same authors report that in 2017, three-quarters of consumers owned two or more credit cards, and one-fifth owned six or more (the median was three cards).

However, owning a particular payment instrument does not imply that consumers actually use it to pay for their in-person purchases. As this article shows, most consumers restrict their use of payment methods to a smaller subset of payment instruments that they own. In fact, this research shows that 13 percent of consumers use only one payment method, which constitutes the highest payment concentration level. These findings apply to consumers who own credit and debit cards and make in-person purchases from 7 merchant categories who are most likely to accept cash, checks, credit, debit cards, and prepaid cards, so the decision which payment instrument to use lies on the consumer side.

This article has two goals: First, to conduct an empirical investigation of consumers' multiple use of payment instruments. Second, to demonstrate how concentration measures, commonly used in merger investigations, can be applied to capture the degree of concentration or diversification of the use of payment instruments for in-person purchases. This investigation is important because, in an era when new payment methods are introduced, policymakers and innovators need to know to what degree a newly introduced payment method will increase the variety of payment methods actually used for in-person purchases, or, will it simply replace existing payment methods.

The data analyzed in this article reveal diverse consumer preference for the use of multiple payment methods. This raises the following question: Why do some consumers concentrate all their payments for in-person purchases on a single instrument while others use multiple payment methods for their in-person purchases? The main advantages of concentrating all payments on a single payment instrument are that it simplifies record keeping, facilitates tracking expenses and

spending, limits the need for multiple funding sources, and also generates one bill (immediate payment in the case of cash).

The main advantages of using multiple payment instruments to pay for in-person purchases are that it allows for selecting different payment instruments according payment dollar amount, type of good/service, and merchant type. In addition, it allows for diversification of the source of funding among different payments and the timing of funding (cash is immediate, debit is same day, and credit is delayed to the end of the billing or borrowing cycle).

This article is organized as follows. Section 2 provides a short review of the literature on homing. Section 3 describes the data. Section 4 defines the payments concentration measures and applies them to respondents who recorded their payment choice for in-person purchases. Section 5 presents a variety of regression results. Section 6 concludes.

2. Short review of the literature on "homing"

Studies on credit and debit cards often use the term "homing" to distinguish between buyers who choose to pay with one payment card (single-homing) from consumers who pay with multiple cards (multi-homing). In general, there are two types of homing: single-homing on a card type (credit, debit, or prepaid), and single-homing on a card network (Visa, Mastercard, Discover, or American Express).

Instead of using term "homing," this article uses the term "payment concentration" and this is for the following two reasons: First, I measure concentration not by just counting the number of payment instruments used, but also by the number of payments made with each payment instrument. Second, other payment instruments, such as cash, checks, and prepaid cards, are also included in this study.

In the economics literature, several authors have analyzed single-homing in card payments. This literature is not surveyed here because it does not cover homing on non-card payments, see Snyder and Zinman (2008) and references therein. Hyytinen and Takalo (2004) analyze payment concentration behavior with respect to all payment media (which include cash and phone in addition to all payment cards) among young people (ages 15 to 28) in Finland. In contrast, I analyze

data for the U.S. adult population (18 and older). Klee (2008) and Cohen and Rysman (2013) use scanner data from grocery stores to analyze payment concentration, but their research cannot distinguish payments made with credit cards from purchases paid for with debit cards.

In this article I broaden their analysis in two ways: First, by analyzing individual consumers' in-person payment behavior in 7 merchant categories that also include grocery stores. Second, the analysis treats credit and debit cards as separate payment instruments. Clearly, there is a cost to this extension because scanner data allow researchers to analyze large samples (some with over a million transactions), whereas diary surveys can collect only a few thousands of payment observations.

Perhaps, the main difference between this article and the above literature is that this paper proposes a novel approach for how to compute and estimate individual consumers' degree of payment concentration by applying concentration measures that are commonly used in the analysis of market power.

3. Data, variable selection, and coding

The study of consumer payment choice at the point-of-sale (POS) involves a classification of payment methods such as cash, credit cards, debit cards, paper checks, and prepaid cards. Data on "how consumers pay" are collected by consumer surveys in which consumers list all the payment instruments they have (adopt) and whether and how they use them at the POS. In particular, *diary* surveys record, either in real time or by the end of each day, all consumers' payment-related activities including dollar amount, spending type, merchant type, and payment method as well as money transfers in general and ATM cash withdrawals in particular.

The data and the R-code used in this analysis are available for downloading from the author's Webpage: www.ozshy.com (click on "Recent articles"). The data are taken from the 2016, 2017, and 2018 Survey and Diary of Consumer Payment Choice (SCPC and DCPC).[1] Both, the SCPC and the

[1]The survey and the diary are conducted in collaboration of the Federal Reserve Banks of Atlanta, Boston, Richmond, and San Francisco. The data and assisting documents (codebooks) are publicly available for downloading from the Federal Reserve Bank of Atlanta Website: https://www.frbatlanta.org/banking-and-payments/consumer-payments.aspx, and are summarized in Greene and Stavins (2018b) and Kumar, Maktabi, and O'Brien (2018). Similar surveys are conducted by the Bank of Canada, see Henry, Huynh, and Welte (2018).

DCPC are representative samples of U.S. consumers. The DCPC records transactions during three consecutive days. Transactions include purchases, bill payments, ATM withdrawals and deposits. Respondents' three day diaries were evenly distributed throughout the months of October 2016, 2017, and 2018 in a way that resembles a three-period overlapping generations model.[2] In order to increase the number of payment observations in the sample, I combine the 2016, 2017 and the 2018 data to obtain 3×3 days of reported payments for each respondent who participated in all three diaries during 2016, 2017, and 2018.

Both, the SCPC and the DCPC have a large number of variables describing all sorts of demographics and transactions. Most of the variables are taken from the DCPC which records actual transactions. I also restrict the analysis to "in-person" (in-person $= 1$) payments and then further restrict to 15,118 payments made by 1143 respondents in 7 merchant categories (merch $= 1, 2, \ldots, 7$).[3] Other used variables include "amnt" (dollar amount of each payment), age, gender, household income, number of people in the household, and education.

From the SCPC, I use 4 binary variables "chk_adopt", "cc_adopt", "dc_adopt", and "svc_adopt" that indicate whether a respondent carries (adopts) checks, credit card, debit card, and stored-value (prepaid) card, respectively. Out of the 15,118 payments, 94 percent were made with the 3 main payment instruments (pi $= 1, 3, 4,$): "cash," "credit card," and"debit card." Therefore, most of the analysis is restricted to the sample of respondents who adopted the 3 main payment instruments (credit and debit cards and cash which is assumed to be adopted by all respondents) during 2016, 2017, and 2018. Finally, I restrict the sample to respondents who made at least 3 purchases during their 3×3 diary days, ending with a sample of 8570 payments for in-person purchases made by 753 respondents.[4]

[2]Jonker and Kosse (2009) compare payment diaries with different time lengths and find that shorter diaries yield more accurate information due to "survey fatigue" which leads respondents to under-report their payment activities.

[3]The merchant categories are: 1. grocery stores, convenience stores without gas stations, pharmacies, 2. gas stations, 3. sit-down restaurants and bars, 4. fast food restaurants, coffee shops, cafeterias, food trucks, 5. general merchandise stores, department stores, other stores, and 6. general services: hair dressers, auto repair, parking lots, laundry or dry cleaning, etc., 7. arts, entertainment, recreation.

[4]For the sake of completeness, concentration will also be computed using 5 payment instruments which will be based on a smaller sample of respondents who also carry (adopt) checks and prepaid cards and who made at least 5 payments during their 3×3 diary days.

4. Measuring concentration of the use of payment instruments

Concentration measures are commonly used by antitrust authorities to evaluate market power of firms operating in a specific market. Curry and George (1983) analyze and compare several concentration indices that can be used to measure market concentration, some of which will be applied in the analysis that follows.

4.1 Motivating and defining a payment concentration index

To motivate the use of concentration measures consider two consumers and two payment instruments, say, cash and debit cards. Consumer A makes 2 payments: one with cash and one with a debit card. Consumer B makes 5 cash payments and one debit card payment (a total of 6 payments). If we just count the incidence of use of each payment method by each consumer, we would conclude that both consumers use all available payment methods (cash and debit cards). However, such a conclusion omits important information that consumer B is mostly a cash user, with an occasional use of debit cards. The concentration measures defined below would indicate significant differences in the use of payment instruments between the two consumers.

Denote by T_i the total number of in-person transactions (payments) made by respondent i during the respondent's 3×3 diary days. Also, let t_i^H, t_i^C, and t_i^D denote the number of payments made with cas*H*, *C*redit card, and *D*ebit card, respectively. Hence, $t_i^H + t_i^C + t_i^D = T_i$. Therefore, respondent i's shares of use of each of the 3 payment methods are given by

$$s_i^H = \frac{t_i^H}{T_i}, \;\; s_i^C = \frac{t_i^C}{T_i}, \text{ and } s_i^D = \frac{t_i^D}{T_i}, \tag{1}$$

where $s_i^H + s_i^C + s_i^D = 1$.

4.2 Measuring the HHI by volume with 3 payment instruments

This section applies the Herfindahl-Hirschman Index (HHI) which is used by the U.S. Department of Justice to review merger proposals. Define the payment method HHI concentration index for in-person payments made by respondent i as the sum of the squared payment shares

$$H_i = H(s_i^H, s_i^C, s_i^D) = (s_i^H)^2 + (s_i^C)^2 + (s_i^D)^2. \tag{2}$$

The highest concentration is obtained when a respondent uses only one payment method for all transactions. For example, $H(1,0,0) = H(0,1,0) = H(0,0,1) = 1^2 = 1$. The lowest concentration is obtained when a consumer equally divides all transactions among the 3 payment instruments, in which case, $H(\frac{1}{3},\frac{1}{3},\frac{1}{3}) = 3(\frac{1}{3})^2 = \frac{1}{3}$. Therefore, with 3 payment instruments, all concentration levels must be in the range $\frac{1}{3} \leq H_i \leq 1$.

The histogram on the top panel in Figure 1 depicts the distribution of respondents' payment concentration levels for the 753 respondents who made at least 3 payments during their diary days. This histogram shows a sharp jump (discontinuity) at the concentration level $H = 0.95$, above which the HHI of 13 percent of the respondents is between 0.95 and 1. In fact, it turned out that all these 13 percent used only one payment method for all their in-person purchase payments. For the top panel in Figure 1, the median concentration level is 0.574 and the average is 0.634. From the 13 percent of the respondents who used only one payment instrument, 21.4 percent used cash only, 33.2 percent paid only with credit cards, and 45.4 percent paid only with debit cards.

Figure 2 plots the HHI concentration levels where respondents are sorted on the horizontal axis according to the number of in-person payments (volume) they made during their 3×3 diary days. For the sake of clarity, Figure 2 excludes 6 respondents who made 30 or more payments. The linear regression line of concentration levels as a function of respondents' total number of purchases yields a statistically significant but very small negative coefficient (also drawn in Figure 2). It shows that the observed concentration levels slightly decrease with the volume (number) of payments respondents made during their diary days.

The important observation from Figure 2 is that there are respondents, who made more than 20 payments, who used only one payment instrument. Therefore, high concentration is not limited to respondents with a small number of payments. However, the dispersion at each number of transactions (illustrated by multiple vertical dots for each number of payments) hints on a weak negative correlation between payment concentration and the number of payments respondents make. More precisely, the correlation coefficient between respondents' number of transactions T_i and the respondents' concentration level is $\rho(T_i, H_i) = -0.151$ revealing very weak correlation.

4.3 Measuring HHI by dollar value

Equation (1) defines the shares of use of payment instruments by volume (number of payment made with each payment instrument). That is, t_i^H, t_i^C, and t_i^D were defined as respondent i's total number of payments made with cash, credit, and debit cards, respectively. However, an alternative definition would be to measure t_i^H, t_i^C, and t_i^D by the total dollar amount consumer i spends using cash, credit, and debit cards, respectively. In this case, (1) and (2) measure concentration in terms of consumers' allocation of dollar spending among the three payment instruments.

The middle panel in Figure 1 shows that 21 percent of the respondents exhibit HHI concentration levels between 0.95 and 1 when payment shares are measured in dollar value instead of volume of payments. This means that 21 percent of the respondents fund their in-person purchases mostly on a single payment instrument. Respondents' dollar spending during their 3×3 diary days ranged from \$15.50 to \$15,345.80. The lowest respondent's HHI with respect to dollar value is 0.334 and the highest is 1. The median HHI is 0.725 and the average is 0.721.

4.4 Measuring the HHI by volume with 5 payment instruments

The histogram on the bottom panel in Figure 1 depicts the distribution of respondents' payment concentration levels for the 244 respondents who adopted all 5 payment instruments (cash, checks, credit, debit, and prepaid cards) and who each made at least 5 payments during their diary days (total 3092 payments). This histogram shows a smaller jump (discontinuity) at the concentration level $H = 0.95$, above which the HHI of 8 percent of the respondents is between 0.95 and 1. In fact, it turned out that all these 8 percent used only one payment method for all their in-person purchase payments. For the bottom panel in Figure 1, the median concentration level is 0.5298 and the average is 0.5741.

The histogram for the 5 payment instruments is brought here mainly for the sake of completeness given the fact that less than 6 percent of the payments were made with checks and prepaid cards. Perhaps the most important finding from the analysis of 5 payment instruments is that, for the 8 percent of the respondents who used only one payment instrument, 17.4 percent used cash only, 42.7 percent paid only with credit cards, and 39.9 paid only with debit cards. That is, none

of these respondents used checks or prepaid cards to pay for all of their transactions.

This finding shows that for respondents who carry all 5 payment instruments, checks and prepaid card are used either infrequently, or for a short period of time. For example, a consumer who received a prepaid gift card in 2016 may have used it until the card ran out of funds. Instead of reloading the card (which bears a fee), this consumer may have switched to cash, credit, or debit card.

4.5 Other concentration measures

Anther widely-used concentration index is the K-firm concentration ratio I^K, which is the sum of the market shares of the K-largest firms in the market. Because most in-person purchases are paid with only three payment instruments, the analysis in this section focuses on I_i^1 which is the share (by volume or value) of the payment instrument used the most by respondent i. Formally,

$$I_i^1 = \max\left\{s_i^H, s_i^C, s_i^D\right\}, \tag{3}$$

where the market shares s_i^H, s_i^C, s_i^D are defined in (1). Applying the I_i^1 defined in (3) to the sample of 753 respondents analyzed in Section 4.2 yields I_i^1 concentration levels between $1/3$ (lowest concentration) and 1 (highest concentration), with median 0.71 and average 0.72 when measured by volume. Measuring payment shares by dollar value, I_i^1 ranges between 0.358 and 1, with median 0.835 and average 0.798.

The third index is a measure of inequality among the use of payment instruments by each consumer. Formally, for each respondent i, the Gini coefficient for 3 payment methods is defined by

$$G_i = \frac{1}{2 \times 3^2 \times \bar{t}_i} \sum_{j\in\{H,C,D\}} \sum_{k\in\{H,C,D\}} \left|t_i^j - t_i^k\right|, \tag{4}$$

where $\bar{t}_i = (t_i^H + t_i^C + t_i^D)/3$ is the average volume of payment across all three payment instruments. Intuitively, the Gini index (4) is half of the relative mean absolute difference. Applying the Gini index defined in (3) to the same sample of 753 respondents yields G_i levels between 0 (lowest inequality) and $2/3$ (highest inequality), with median 0.44 and average 0.45, when measured by volume. Measuring payment shares by dollar value, G_i ranges from 0.026 (lowest) to $2/3$ (highest

inequality), with median 0.553 and average 0.511.

Finally, as expected the three indices (H_i, I_i^1, and G_i) are highly correlated across all the 753 respondents, with correlation coefficients $\rho(H_i, G_i) = 0.945$, $\rho(H_i, I_i^1) = 0.966$, $\rho(G_i, I_i^1) = 0.963$.

5. Regressions

The analysis in this section introduces two types of regression. Subsection 5.1 investigates whether consumers' level of payment concentration is affected by total payment volume or value as well as demographic variables. Subsection 5.2 regresses each choice of payment method on the previous choice of payment method made by the same respondent. Regression results yield probabilities that a choice of a particular payment instrument will be repeated on the respondent's next purchase.

5.1 Concentration level regressions

Figure 1 reveals that consumers are heterogeneous with respect to their choice of whether to diversify or concentrate their use of payment instruments for in-person purchases. The regressions below investigate whether consumers' degree of payment concentration is related to any demographic, volume, or value of payments characteristics. Consider the following regression model:

$$\begin{aligned} \text{concentration}_i = \alpha_i &+ \beta_N \text{volume}_i + \beta_T \text{value}_i + \beta_A \text{age}_i + \beta_I \text{hh\_income}_i + \beta_S \text{hh\_size}_i \\ &+ \delta_K \text{Some\_college}_i + \delta_O \text{Assoc}_i + \delta_B \text{BA}_i + \delta_H \text{MA\_or\_higher}_i \\ &+ \delta_M \text{married}_i + \delta_G \text{male}_i + \delta_W \text{employed}_i, \end{aligned} \tag{5}$$

where $i = 1 \ldots 753$ indicates a unique respondent. The dependent variable "concentration" refers one of the three concentration measures: the HHI (2), the I^1 (3) and the Gini coefficient (4). The data used for the regression model (5) consist of the same 753 respondents who adopted the 3 main payment instruments and analyzed in Section 4.2.

The first row in the regression model (5) lists only numerical variables. "value" measures the aggregate dollar amount paid by respondent i during the respondent's 3×3 diary days. The minimum "value" is \$15.50, maximum is \$15,345.80, median is \$279.60 and the average value is

$394.40. Similarly, "volume" measures the total number of payments (using all the 3 payment methods). The minimum is 3 payments, maximum is 43, median is 11, and average is 11.38 payments over the 3×3 diary days.

The remaining numerical variables are demographic: "age" (minimum is 20, maximum is 83, with median 53 and average 51.69). The minimum household income "hh_income" is $0, maximum is $1,200,000 with median $78,000 and average $92,918. Number of people in the household "hh_size" ranges from 1 to 8 with median 2 and average 2.66.

The second row in (5) lists education dummy variables: 93 respondents have high school diploma or less (reference level), 118 have some college, 116 have an associate degree, 241 BA degree, and 185 MA or higher.

The third row in (5) lists 3 additional demographic variables: Marital status is divided into 496 "married" and 257 are not married (reference level). Gender is divided into 407 female (reference level) and 346 male respondents. Work is divided into 540 employed and 212 not employed respondents (reference level).

Table 1 exhibits three regression results for the regression model (5). The three columns of coefficients are similar because, as shown in Section 4.5, the three concentration measures are highly correlated. Table 1 shows that the effects of volume and age are statistically significant, however, the coefficients are small and therefore have very little influence on concentration. Being married (versus not married) or male (versus female) increase the HHI index by 0.036 and 0.028 respectively, meaning that these variable also have very small influence on concentration. Finally, the adjusted-R^2 is extremely low, which reflects large dispersion among respondents with respect to their payment concentration level.

Overall, the weak correlations with respect to total spending and consumer demographics exhibited in Table 1 have very important implications: Consumers' preference or need to concentrate or diversity their use of payment methods are not related to observable variables. Instead, the preference for concentrating or diversifying the use payment methods can be viewed as a separate characteristic that may be related to how consumers handle their own finances in general and how they fund their payment instruments in particular.

5.2 Regression on previous payment choice

I conclude the analysis of payment concentration with three regressions. The dependent variable of the first regression is choice of cash (1 or 0) as a function of whether the respondent chose to pay cash for her previous purchase (also 1 or 0). The second regression tests the same effect of how the choice of paying with a credit card is affected by whether the respondent paid with a credit card for the previous purchase. The third regression tests the same for the choice of paying with debit cards.

Other independent variables include the same demographic variables used in the concentration regression model (5) and the 7 merchant types listed in Footnote 3. I also add the categorical variable "Year" where 2016 is the reference level.[5] To be able to regress each payment choice on each respondent's previous payment choice, I removed the first payment of each of the 753 respondents from the sample, ending up with 7691 payment observations.

Table 2 presents the marginal effects for each regression. The column "Cash" shows that the probability of paying cash increases by 0.29 if the consumer chose to pay cash for the previous purchase. The columns "Credit" and "Debit" show that this effect is substantially higher for card payments. More precisely, paying with a credit card increases the probability that the next purchase will be paid with a credit card by 0.49. Similarly, paying with a debit card increases the probability that the next purchase will be paid with a debit card by 0.47.

Table 2 also presents the marginal effects with respect to the type of merchant to whom the payment was made. The reference merchant type is groceries stores and pharmacies. Therefore, the table shows that the probability of paying cash increases by 0.25 if the purchase is made at a fast food restaurant or a coffee shop instead of paying for groceries or at a pharmacy (reference level). In contrast, the choice of paying with credit or debit card declines if the payment is at a fast food or coffee shop relative to paying for groceries or at a pharmacy. Similar marginal effects apply also to general services.

Finally, it should be pointed out that the variable "amnt" (the dollar value of each payment)

[5]Credit card fees (or subsidy via "cash-back" programs) may also influence consumers' overall use of credit cards, see Zinman (2009) and references therein. These fees are not included in the regressions because the data does not include information on the exact fee (or cost, in the case of cash) that consumers pay for each specific transaction.

was not included in the three regressions shown in Table 2. This is because dollar amount has been shown many times to be the most influential variable for explaining the choice of paying cash. This relationship is particularly strong for payment values below $20, see Greene and Stavins (2018b) Figure 1, Kumar, Maktabi, and O'Brien (2018) Figure 3, and Shy (2019) Figure 1, as examples. Including "amnt" as an explanatory variable in the logit regressions would result in complete separation that would conceal the effects of the previous purchase as well as other variables. .

6. Discussion

This article develops a method for tracking and analyzing consumers' multiple use of payment instruments for in-person purchases. The novelty of this approach is the empirical application of concentration indices to measure how consumers diversify or concentrate their use of various payment methods.

A natural question to ask is whether the results of this analysis overestimate or underestimate consumers' payment concentration. Overestimation may be a consequence of that the diary survey tracks consumers for only three days. On the other hand, this analysis tracks three days for three different years (total of nine days) which probably mitigates the short tracking time effect.

However, there is a good reason to believe that the analysis may be underestimating payment concentration because the analysis excludes respondents who do not have credit or debit cards. This restriction is necessary for this analysis as otherwise consumers cannot diversity their use of payment instruments. Consumers with no cards tend to use mostly cash and are therefore highly concentrated.

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	HHI		Gini		I^1	
Variable	Coefficient	Sig	Coefficient	Sig	Coefficient	Sig
(Intercept)	0.725772	***	0.514535	***	0.818148	***
Value	-0.000012		-0.000007		-0.000007	
Volume	-0.004909	***	-0.003268	***	-0.003466	**
Age	-0.001396	*	-0.000882	.	-0.001477	**
Houshold income	-0.000000		0.000000		0.000000	
Household size	0.000583		0.002564		0.000289	
Education/Some college	0.026190		0.004312		0.013675	
Education/Assoc degree	-0.010568		-0.023763		-0.019531	
Education/BA degree	0.018615		0.007173		0.015749	
Education/MA or higher	0.011686		0.003328		0.003855	
Marital/Married	0.036125	*	0.019006		0.024327	
Gender/Male	0.028225	.	0.017919		0.022269	.
Work/Employed	-0.009547		-0.006420		-0.015928	
No. respondents	753		753		753	
Adjusted R^2	0.034956		0.025306		0.025231	

Table 1: Results for 3 concentration level regressions on respondents' aggregate volume and value of in-person payments and demographic variables. *Note*: (***), (**), (*), and (·) correspond to the 0.1, 1, 5, and 10 percent confidence thresholds, respectively.

	Cash		Credit		Debit	
Variable	dF/dx	Sig	dF/dx	Sig	dF/dx	Sig
Previous payment choice	0.291	***	0.496	***	0.472	***
Merch/Gas station	0.002		0.051	*	-0.050	*
Merch/Restaurant, bar	0.097	***	0.022		-0.113	***
Merch/Fast food, coffee shop	0.258	***	-0.118	***	-0.136	***
Merch/General stores	-0.032		0.060	**	-0.042	*
Merch/Genereal services	0.360	***	-0.134	***	-0.201	***
Merch/Arts, entertain, recreation	0.106	**	-0.064	*	-0.060	.
Year/2017	0.026		-0.022		-0.026	
Year/2018	0.010		-0.029		-0.007	
Age	0.006	***	-0.002	***	-0.003	***
Household income	-0.000	**	0.000	***	-0.000	***
Household size	0.012	*	-0.000		-0.008	
Education/Some college	0.008		0.026		-0.031	
Education/Assoc degree	-0.052	*	0.017		0.034	
Education/BA degree	-0.063	***	0.117	***	-0.044	*
Education/MA or higher	-0.076	***	0.163	***	-0.079	***
Marital/not married	0.040	**	-0.021		-0.013	
Gender/Male	0.006		0.022	.	-0.031	*
Work/Not employed	-0.041	**	0.049	**	-0.021	

Table 2: Marginal effects of three binomial logit regressions on previous choice of payment instrument, merchant type, and demographic variables. Each regression is based on 7691 payments by 753 respondents. *Note*: (***), (**), (*), and (·) correspond to the 0.1, 1, 5, and 10 percent confidence thresholds, respectively.

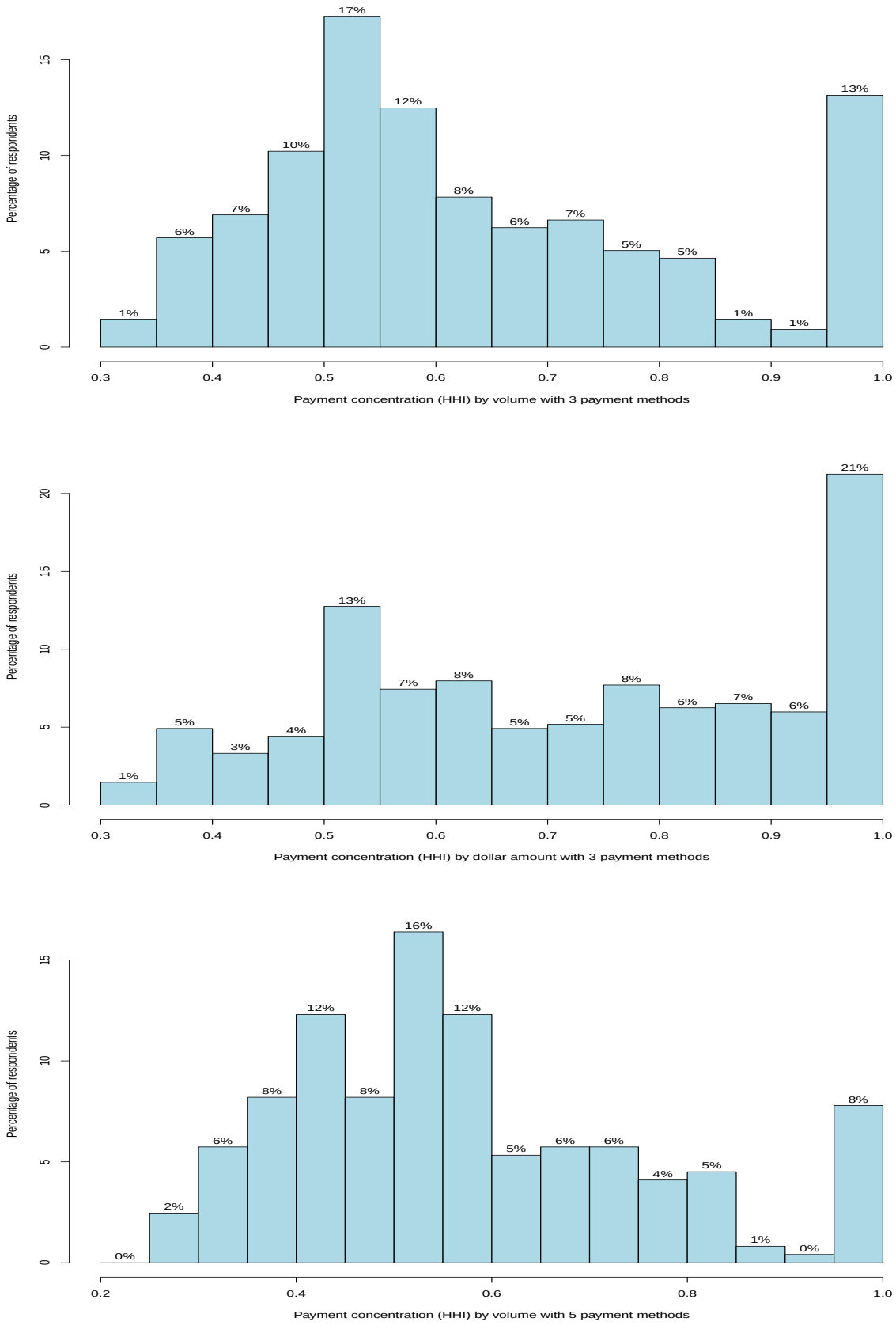

Figure 1: Histograms of payment instruments HHI concentration levels. *Top*: 753 respondents who each made at least 3 payments (total 8570 payments) with 3 payment instruments (cash, credit, and debit). *Middle*: HHI concentration levels when payment shares are measured in dollar value (instead of volume). *Bottom*: 244 respondents who each made at least 5 payments (total 3092 payments) with 5 payment instruments (cash, credit, debit, check, or prepaid card).

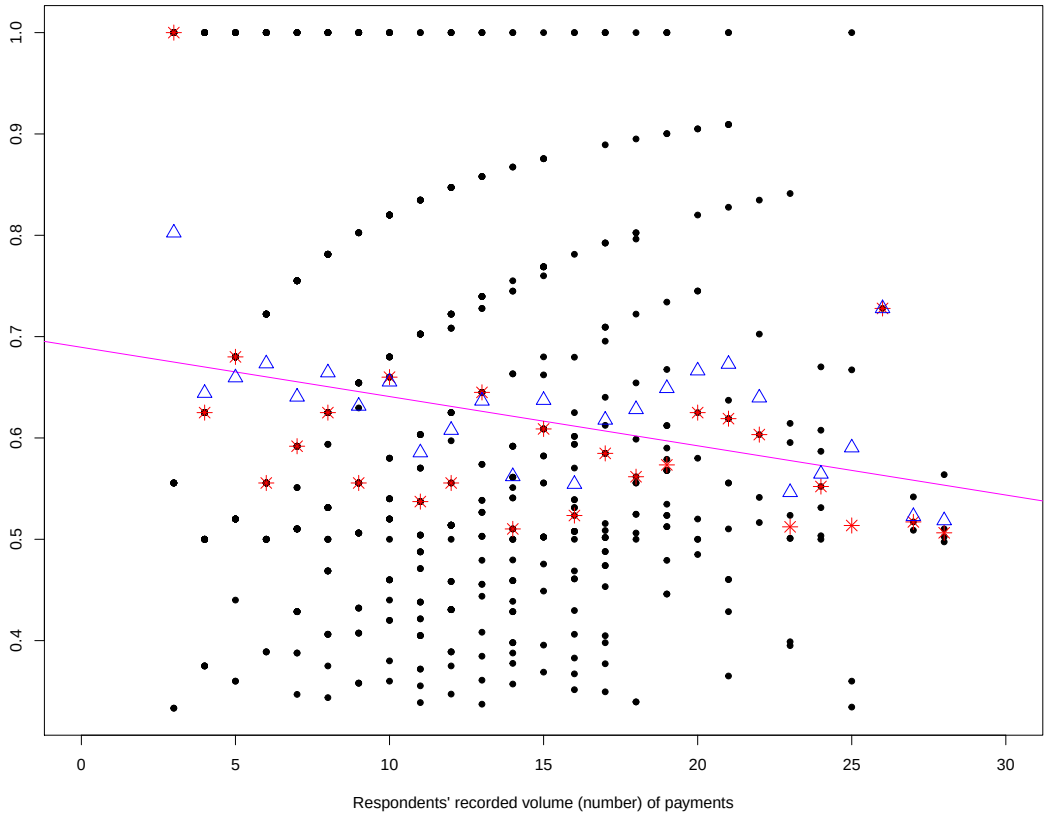

Figure 2: Payment instruments HHI concentration measures plotted against number of payments made by respondents who made at least 3 payments during their 3×3 diary days. For each volume of payments, ($*$) indicates HHI averages and ($\triangle$) indicates medians.
Note: The figure excludes 6 respondents who made 30 or more payments.