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How Merchants Get Paid*

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Abstract
Using a representative sample of actual payments made by adult U.S. consumers, this article analyzes the composition of payment methods consumers use to pay for goods and services. Consumer spending is divided into 21 main merchant categories. Results show the distributions of electronic, card, and paper payment methods and the degree of payment concentration for each merchant category.

Key words: how merchants get paid, payment methods, payment instruments

JEL classification: D9, E42, M2

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1. Introduction

Payments for purchases of goods and services, bill payments, and payments to other people are made with a variety of payment methods (also called payment instruments). The purpose of this research is to analyze which payment methods consumers use to pay for different types of goods and services provided by different merchant types. The term "merchants" refers to all types of sellers who sell directly to consumers, including all retail stores (brick-and-mortar and online), utility service providers, general services, travel services, financial services, government, and more (the exact definitions are provided in section 2).

Using a representative sample of actual payments made by adult U.S. consumers, this article analyzes the composition of payment methods consumers use to pay for goods and services in each merchant category. Consumer spending is divided into 21 main merchant categories. For each merchant category, I compute the proportion of each payment method consumers use to pay merchants, both by volume and by dollar value. Results show the distributions of electronic, card, and paper payment methods and the degree of payment concentration for each merchant category.

In addition, this research uses the Herfindahl-Hirschman index (HHI) to compute the payment method concentration index for each merchant category. Whereas the HHI is commonly used to measure the degree of market concentration among firms, I find the same method also useful for comparing the degree of payment method concentration or diversification among all 21 merchant types.

The list below provides a description of the payment methods collected by the data described in section 2.

Electronic payment methods:

- Bank account number payment (BANP): You [the respondent] give your bank routing number and account number to a third party to authorize a deduction from your bank account.
- Online banking bill pay (OBBP): You initiate a payment at your bank's online banking website.

- Account-to-account money transfers.
- Income deduction: Your employer makes the payment for you on your behalf and deducts the payment amount from your salary.

Card payment methods:

- Debit card: Your payments are deducted from your bank account. Also, you can use a debit card to withdraw or deposit cash at ATMs.
- Credit card: You pay back the credit card company later. Credit cards charge interest (unless the balance is paid by the initial due date).
- Prepaid/gift/EBT card: You store or load money on a prepaid card. Sometimes called "prepaid debit," "gift cards," "payroll cards," or "stored value cards."

Paper payment methods:

- Cash: Coins and paper bills.
- Check: You write a paper check to a person or business.
- Money order: You purchase a money order from a bank, post office, check-cashing store, or retail store. At the time of purchase, you specify the amount and the person or business to be paid.

Mobile app: It is important to emphasize that *a mobile app is not a payment instrument*. Logically, a mobile app should be viewed as an electronic wallet that stores information on the payer's credit cards, debit cards, or bank account number. More precisely, a mobile app payment depends on the type of funding (source of money) that funds each transaction, generally a credit card, debit cards, or a bank account. A consumer who funds a mobile app payment with a credit or debit card will see the charge on the card's monthly statement. Therefore, in our data, a mobile app payment is recorded twice: as a mobile app payment and also, for example, as a debit card payment if the mobile app is funded by a debit card.

For that reason, the core analysis in this article does not view mobile app as a payment method. However, because this paper examines the merchant side, it is possible that some merchants may

view a mobile app as a separate payment method. Therefore, mobile app payments are analyzed towards the end of this article

In the literature, several papers have analyzed how consumer payment choice varies with respect to payment dollar amount, credit card rewards, merchant card acceptance policy, whether the consumer borrows on a credit card (revolver), and consumer demographics; see, for example, Zinman (2009); Arango, Huynh, and Sabetti (2015); and Wakamori and Welte (2017). This literature does not distinguish among the merchant types, which is the subject of the present paper. Some literature focuses on a particular merchant type; for example, Klee (2008) analyzes how consumer pay at grocery stores, Wang and Wolman (2016) use data from a discount retailer with thousands of stores, and Zhang (2016) analyzes how people pay rent. Finally, Bounie and François (2011) and Greene and Stavins (Forthcoming 2020) focus on consumer bill payments.

The present paper adds to the above literature by attempting to integrate all types of consumer payments into a single analysis for the purpose of getting an overview how different merchants get paid. This is accomplished by aggregating all payment types (in-person, remote, bill, and nonbill) for each merchant type for the purpose of obtaining a broad summary of how merchants get paid. In doing so, this paper abstracts from consumer and merchant incentives to use their preferred payment methods. More precisely, this research summarizes actual payments without analyzing consumers' decision-making process of why they choose their payment method for each transaction.

This article is organized as follows. Section 2 defines merchant types, describes the data, and presents sample statistics by merchant type. Section 3 analyzes how merchants get paid and compares merchant types by payment method concentration. Section 4 analyzes payments by dollar value. Section 5 groups all payment methods into three main payment categories. Section 6 briefly analyzes payments made via mobile apps. Section 7 concludes.

2. Data and sample statistics

This section defines merchant types, describes the data, and presents sample statistics by merchant type. The data are taken from the 2019 Diary of Consumer Payment Choice (DCPC).[1] The DCPC uses a representative sample of U.S. (18 and older) 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 month of October 2019 in a way that resembles a three-period overlapping generations model.

The DCPC collects a large number of variables describing all sorts of demographics and transactions. For the purpose of this article, I focus on only a small subset of variables. Table 1 lists 21 merchant categories that respondents used to categorize each payment. This list provides straightforward description of each of the 21 merchant types. Note that merchant type 16 is slightly different because it also involves person-to-person money transfers among family and friends, in addition to paying to somebody for performing a small job.

Table 2 provides sample statistics on the number of payment observations and average and median payment values for each of the 21 merchant types. I also chose to display respondents' household incomes because they provide some indication on which population is served by each merchant type. For example, according to Table 2, the weighted median household income of consumers who paid merchant type 14 (rent) is \$48,000. On the other extreme, the weighted median household income of consumers who pay merchant type 9 (taxis, airplane, delivery) is \$125,000.

Table 3 divides consumer payments into two types: "in-person" payments, where the consumers (payers) are physically present at the merchant site, and "remote" payments that are made while the consumers are not physically present at the merchant site. It should be noted that some types of payments fall into a gray area because they could be classified as either in-person or re-

[1]The Federal Reserve Banks of Atlanta, Boston, and San Francisco conduct the diary, which is summarized by Greene and Stavins (2019) and Kumar and O'Brien (2019). Similar surveys are conducted by the Bank of Canada; see Henry, Huynh, and Welte (2018). 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. The data and the R-code used in this analysis are available for downloading from the author's web page: www.ozshy.com (click on "Recent articles").

mote. For example, a payment to Uber or Lyft during the ride may be classified as "in-person" whereas a payment after a passenger is dropped off may be classified as "remote." Other examples of gray areas include unattended parking garages, self-checkout counters at grocery stores, and vending machines, where consumers (payers) are physically present, but the merchant side is only virtually present in the form of unattended card reading or cash machines.

Out of 12,269 total payments made by 2,564 respondents, the 2019 DCPC sample generated the following distribution of payment volume across the payment methods:

- Debit card: Used for 3,302 payments (27 percent).
- Cash: Used for 3,201 payments (26.18 percent).
- Credit card: Used for 2,961 payments (24.22 percent).
- Check: Used for 744 payments (6.08 percent).
- Bank account number payment (BANP): Used for 707 payments (5.78 percent).
- Online banking bill pay (OBBP): Used for 647 payments (5.29 percent).
- Prepaid/gift/EBT card: Used for 210 payments (1.71 percent).
- Income deduction: Used for 46 payments (0.37 percent). The reason for this low use is that actual payments are restricted to paydays only. Some people may not have any income deduction because they may not be employed, or because there are 1099 workers who have no deductions. Others may receive their paychecks only once or twice each month. Therefore, the DCPC does not capture income deductions for most of the respondents. For this reason, the analysis that follows drops income deduction payments from the sample.
- Money order: Used for 25 payments (0.2 percent). Because of the low use, this payment method is dropped from the sample in the analysis that follows.

The data show that most consumers payments are made with debit cards (27 percent), followed by cash (26.18 percent) and credit cards (24.22 percent). Checks, BANP, and OBBP were used each for 5 to 7 percent of the payments. Prepaid cards (1.71 percent) show low use. Income deductions and money orders are hardly used and are not used in the analysis that follows.

3. Analysis of payments by volume

Table 4 shows the percentage use of the eight main payment methods (defined in section 1): cash, checks, credit cards, debit cards, prepaid cards, bank account number payment, online bank bill payment, and account-to-account money transfers. Income deductions and money orders are not analyzed because the data indicate low use (less than half a percent). Each row corresponds to one merchant type and sums up to 100 percent. Figure 1 visualizes Table 4, showing the fractions of payment methods by merchant type.

3.1 Measuring payment method concentration

Table 4 and Figure 1 display the value of the Hirschman-Herfindahl index for each merchant type. Appendix A provides the exact derivation of this index, along with examples. Higher HHI values reflect higher payment concentration (lower diversification) because merchants receive most of their payments using only a few payment instruments. Lower HHI values reflect lower payment concentration (higher diversification) because merchants get paid more evenly with a larger number of payment methods.

The merchant types in Figure 1 are sorted left to right by HHI values. Payments made to merchants of type 20 (education/childcare), type 10 (phone/internet/cable), and type 12 (professional services) are shown to be almost equally diversified among the main payment methods. In contrast, type 16 merchants (person-to-person) exhibit large concentration (with HHI=5,394) because they receive most of their in-person payments in cash. An examination of the right-hand side of Figure 1 reveals that type 13 merchants (hotel/campsite) receive a large portion of their payment in credit and debit cards.

3.2 Sorting merchant types by percentage volume of use of payment methods

The analysis so far sorted merchant types by the degree of concentration with respect to use of payment methods (see Table 4). The remainder of this section uses Table 4 to rank merchant types by the fraction of use of each payment method separately. This section analyzes payment method

intensity by volume of use (number of payments). Section 4 analyzes merchants by amount of dollar value spent with each payment method.

Percentage volume of cash payments: The column labeled "Cash" in Table 4 can be sorted from high to low percentage of cash payments. Not surprisingly, person-to-person payments (type 16) are the most cash intensive, with 71.8 percent payments made with cash. Fast food and coffee shops (type 4) rank second, with 43 percent cash payments. Payments for arts/entertainment (type 7 merchants) are 39.2 percent cash, and public transport/tolls payments (type 21) are 39.1 percent cash. Charitable/religious donations (type 17) are 38.8 percent cash, and payments for general services (type 6) are 38 percent cash.

In contrast, mortgage/insurance/credit cards (type 15) are the least cash intensive, with only 1.4 percent made in cash. Phone/internet/cable payments (type 10) are only 2.7 percent cash and utilities (type 8) are 3.5 percent cash.

Percentage volume of paper check payments: The column labeled "Check" in Table 4 shows that 47.1 percents of payments made to contractors, plumbers, and electricians (type 11 merchants) are made with checks. The reason for that is quite simple. Contractors are generally small businesses who serve customers at their own homes. To avoid paying card processing fees, contractors ask for paper checks, which bear no fees.

Of all charity and donations payments (type 17), 38.5 percent are made with checks, as some of these entities also try to avoid card processing fees. Of rent payments (type 14), 36.9 percent are paid with checks for the same reason, as landlords try to avoid paying card processing fees. Of government taxes (type 19), 35.2 percent are paid with checks. Schools and colleges (type 20) follow, with 26.7 percent of payments with checks.

Table 4 also shows a significant number of merchants who receive very few checks (or none). For example, transportation-related merchants (type 21 and type 9) are not paid with paper checks.

Percentage volume of credit card payments: The column labeled "credit" in Table 4 shows that credit card payments dominate merchants related to hospitality services: 62.8 percent of payments

to hotels (type 13) are made with credit cards, followed by 56.2 percent paid for taxis, airplanes, and delivery (type 9), followed by 37.7 percent paid to restaurants/bars (type 3).

On the other extreme, less than 3 percent of person-to-person payments (type 16) and rent (type 14) are paid with credit cards.

Percentage volume of debit card payments: The column labeled "Debit" in Table 4 shows that over 35 percent of payments to grocery stores (type 1), general merchandise (type 5), and gas stations (type 2) are made with debit cards. In addition, a large number of other merchant types receive around 30 percent of their payments with debit cards.

On the other extreme, around 5 percent of person-to-person (type 16) and charitable and donations (type 17) payments are made with debit cards.

Percentage volume of prepaid card payments: The column labeled "Prepaid" in Table 4 shows that 11.3 percent of all payments made for public transport (type 21) are made with prepaid cards. The reason is that many public transportation systems around major cities issue transportation prepaid cards directly to customers, who can load more value to the cards either online or via vending machines located in terminals.

Otherwise, prepaid cards are hardly used. Specifically, although consumers can buy prepaid cards in pharmacies and other stores, consumers find loading funds on these cards to be costly (see Hayashi and Cuddy 2014). For this reason, prepaid cards serve mainly the unbanked or children, who typically do not have bank accounts.

Percentage volume of BANPs: Recall that BANPs are made by giving the payers' bank account details to the merchants, who then withdraw money directly from the payers' account. Therefore, BANPs are mainly for bills.

The column labeled "BANP" in Table 4 shows that 39 percent of payments made to financial institutions (type 15) are BANPs, followed by utility companies (type 8) and phone/internet/cable companies (type 10), who receive 19.9 percent and 19.1 percent of their payments via BANP, respectively.

For rent (type 14), 16.2 percent of payments are BANP. Taxes (type 19) follow, at 15.4 percent. Note that the DCPC collects data during the month of October, which is not the federal tax season. Next, 14.9 percent of school/college/childcare (type 20) are made via BANP.

Percentage volume of OBBPs: Similar to BANP, OBBP are bill payments. OBBPs are made by the payer via the payer's online banking. The column labeled "OBBP" in Table 4 shows that around 30 percents of payments made to utility companies (type 8) and financial institutions (type 15) are made via OBBP. This is followed by phone/internet/cable companies (type 10), which receive 18.2 percent of their payments via OBBP.

Percentage volume of account-to-account money transfers: The column labeled "Acct2acct" in Table 4 shows that account-to-account transfers are not used very often: 5.8 percent of payments to financial institutions (type 15) and 4.8 percent of person-to-person (type 16) are account-to-account transfers.

4. Measuring shares of payment methods by dollar value

The analysis so far was based on payment volume of each payment method consumers use to pay each merchant type. That is, the percentage of cash payments to each merchant type was computed by dividing the total number of cash payments by the total number of payments made to this merchant type using all payment methods.

This section takes a different approach by looking at the fraction of total dollar value paid to a merchant with a specific payment method out of total dollar value this merchant collects through all payment methods. For example, the fraction of cash by value paid to each merchant is computed by summing up the total dollar value of cash payments to this merchant divided by total dollar value (sales value) this merchant collects through all payment methods.

Table 5 displays the fraction of dollar value of each payment method paid to each merchant type. Comparing with Table 4, Table 5 displays HHI values that are computed with respect to dollar value instead of volume of payments. These two measurements are very different because, as shown below, some merchants may receive very few of a certain payment type, but each payment

carries a large dollar value. In fact, the correlation coefficient between HHI by value (Table 5) and HHI by volume (Table 4) is 0.32, which is positive but low. However, as shown below, correlations between volume and value by payment method tend to be much higher.

Percentage value of cash payments: The correlation coefficient between percentage of cash volume and cash value is 0.8. The column labeled "Cash" in Table 5 shows that 33.5 percent of revenue collected by fast food and coffee shops (type 4) is in cash. This is followed by 30.3 percent of cash revenue collected by public transport (type 21), and 23.8 percent of cash dollar value transferred from person to person (type 16).

Percentage value of paper check payments: The correlation coefficient between percentage of check volume and check value is 0.88. The column labeled "Check" in Table 5 shows several merchant types for which the percentage revenue collected with checks exceeds 70 percent. More precisely, checks constitute 77.5 percent of the dollar value of government taxes (type 19), followed by 74.3 percent of check dollar value paid to contractors (type 11), and 71.4 percent of cash value paid to professional services (type 12).

Percentage value of credit card payments: The correlation coefficient between percentage of credit card volume and value is 0.93. The column labeled "Credit" in Table 5 shows that 75.1 of the revenue collected by taxi/airplane/delivery (type 9) is with credit cards. This is followed by hotels (type 13) that collected 74.3 percent of their revenue with credit cards. The column labeled "Credit" in Table 5 also shows that five other merchant types collect between 40 and 60 percent of their revenue with credit cards.

Percentage value of debit card payments: The correlation coefficient between percentage debit card volume and value is 0.91. Of the revenue collected by grocery stores (type 1), 47.1 percent is by debit cads, followed by 38.6 percent of the revenue collected by gas stations (type 2), and 37.6 percent by fast food and coffee shops (type 4). The column labeled "Debit" in Table 5 also shows six other merchant types that collect between 20 and 30 percent of their revenue with debit cards.

Percentage value of prepaid card payments: The correlation coefficient between percentage prepaid card volume and value is 0.85. As with volume, prepaid cards show low use also by dollar value. The highest is public transport (type 21), where 5.4 percent of dollar amount is paid with prepaid card (recall from Table 4 that this merchant type is also highest when measured by volume, 11.3 percent).

Percentage value of BANPs: The correlation coefficient between percentage BANP volume and value is 0.88. Of the revenue collected by financial institutions (type 15), 35.5 percent is via BANP, followed by 34.5 percent of the revenue collected by school/daycare (type 20), followed by 23.6 percent by phone/internet/cable (type 10).

Percentage value of OBBPs: The correlation coefficient between percentage OBBP volume and value is 0.93. OBBP accounts for 43.3 percent of the dollar value paid to financial institutions (type 15). Utility companies (type 8), at 27.7 percent, and phone/internet/cable (type 10), at 20.3 percent, follow.

Percentage value of account-to-account money transfers: The correlation coefficient between percentage account-to-account volume of transfers and value of transfers is 0.84. The column labeled "Acct2acct" in Table 5 shows that 13.5 percent of dollar value paid by a person to another person (type 16) are transfers from account to account. For most other merchant types, the dollar value of account-to-account transfers is zero or very small.

5. Grouping payment methods into payment categories

The analysis so far focused on the main payment methods consumers use to pay the wide variety of merchants. However, for some purposes, it may be useful to examine payment choice when all payment methods are grouped into main categories that characterize these payment methods.

Recall that the introduction to this article classifies all payment methods into three main groups:

- Paper instruments: Cash, paper checks, and money orders.
- Payment cards: Credit, debit, and prepaid cards.

- Electronic methods: Bank account number payments (BANP), online bank bill payments (OBBP), income deductions, and account-to-account money transfers.

The analysis in this section groups all payment methods into these three groups, disregarding income deductions and money orders due to their low use (see Section 2 for the exact numbers). By volume, these three groups consist of 3,945 (35.3 percent) paper instrument payments, 6,473 (58 percent) card payments, and 743 (6.7 percent) electronic payments.

Percentage of paper instrument payments: Figure 2 displays the percentage use of paper methods by merchant type. Of person-to-person payments (type 16), 87 percent are made with paper instruments, followed by 82 percent paid to charitable and religious donations (type 17).

Paper instrument payments constitute between 61 and 66 percent of the payments made for government taxes (type 19), rent (type 14), education/childcare (type 20), and contractors (type 11). As shown before, these payments are made mostly with paper checks because these merchants prefer paper checks over credit card payments that subject them to card processing fees.

On the other extreme, paper instrument payments constitute only 5 percent of payments for taxi/airplane/delivery (type 9), and 12 percent for phone/utility/cable (type 10).

Percentage of card: Figure 3 shows that card payments constitute 95 percents of the payments made to taxi/airplane/delivery (type 9), followed by 79 percent made to hotels (type 13). Recall that these two merchant categories were also listed towards the bottom of Figure 2 (percentage of paper instrument payments) because these two merchant types are dominated by credit and debit card payments.

On the other extreme, the bottom of Figure 3 lists several merchant types that are also listed on the top of Figure 2. That is, person-to-person (type 16), charitable and religious donations (type 17), rent (type 14), and education/childcare (type 20) exhibit heavy use of paper instruments and low use of credit and debit cards. Again, these merchants are very sensitive to card processing fees and therefore prefer paper check payments over card payments.

Percentage of electronic payments: Electronic payments are generally associated with remote (not in-person) bill payments. Most of these payments are routed via the ACH (automated clearing house). The top of Figure 4 shows that electronic payments constitute 57 percent of payments made to financial institutions (type 15), followed by 39 percent paid to utility companies (type 8) and 24 percent paid to phone/internet/cable (type 10).

On the other extreme, electronic payments are not used by merchants who do not issue scheduled bills. These merchants include hotels (type 13), restaurant/bar (type 3), fast food and coffee shops (type 4), taxi/airplane/delivery (type 9), gas stations (type 2), and grocery stores (type 1).

6. Mobile app payments

The 2019 DCPC recorded 175 payments consumers made to merchants via a mobile app. This amounts to 1.45 percent out of a total of 12,043 payments made to merchants.

Recall from the discussion in the introduction that a mobile app is not a payment instrument by itself. This is because mobile payment apps must be funded by other payment instruments, such as credit cards, debit cards, or bank accounts. However, because some merchants may view a mobile app as a payment method, Figure 5 ranks merchant types by the percentage of payments merchants receive via mobile apps. The figure shows that only 10 percent of type 16 merchants (mainly P2P) are made via mobile apps. The second highest are type 7 merchants (arts and entertainment), who receive 5 percent of their payments via a mobile payment app.

Overall, Figure 5 shows very little use of payment apps relative to other payment methods, ranging from 0 percent to 3 percent, with the exception of the type 16 and type 7 merchant types.

7. Discussion

This article provides information and analyzes the type of payments received by different merchant categories. The 21 merchant types listed in Table 1 seem to cover all (or most) possible types of spending made by U.S. consumers. Therefore, the consumer side of payments made to merchants seems to be fully covered.

However, one limitation of the analysis in this paper is that from the merchant point of view,

this article does not analyze business-to-business (B2B) payments because the Diary of Consumer Payment Choice collects the data directly from consumers. Analyzing how merchants pay other merchants requires data taken directly from merchant payment surveys.

A second limitation of the analysis (which is common to all research on use of payment methods) is that it cannot distinguish between supply-and-demand side effects of payment activities. Demand constraints refer to merchants who refuse to accept a certain payment method, such as credit cards, or surcharge consumers for the use of credit cards to cover their card processing fees.[2] Another example are merchants who, for safety reasons, may refuse to accept paper checks or cash (to protect employees who work at night or in high-crime areas). In contrast, supply constraints refer to consumers who may not have all available payment methods (such as unbanked consumers who must use either cash or prepaid cards).

Appendix A Measuring concentration of the use of payment instruments

The column on the right in Table 4 displays the HHI for each merchant type. High HHI scores correspond to merchants who receive most payments using only a few payment methods. Low HHI scores correspond to merchants who receive payments more evenly with a larger variety of payment methods.[3]

The motivation for using concentration measures is as follows. Consider two merchants and two payment instruments, say, cash and debit cards. Merchant 1 receives two payments: one with cash and one with a debit card. Merchant 2 receives five cash payments and one debit card payment (a total of six payments). If we just count the incidence of use of each payment method for each merchant, we would conclude that both merchants receive their payments using all available payment methods (cash and debit cards). However, such a conclusion omits important information that merchant 2 receives most of the payments with cash, and only a few payments are received via debit cards. The concentration measures defined below would indicate significant differences in the use of payment instruments between these two merchants.[4]

[2] For a worldwide comparison of credit card interchange fees (which are part of merchants' card processing fees), see Hayashi and Minhas 2018.

[3] This paper focuses on merchant (payee) concentration. For consumer (payer) concentration, see Shy 2019.

[4] Curry and George 1983 analyze and compare several concentration indices.

I first define the Herfindahl-Hirschman Index (HHI) for payment methods (see Table 4) made to merchant m ($m = 1, 2, \ldots, 21$) as the sum of the squared payment percentage shares:

$$\begin{aligned} \text{HHI}_m &= H(s_m^H, s_m^K s_m^C, s_m^D, s_m^P, s_m^B, s_m^O, s_m^A) \\ &= (s_m^H)^2 + (s_m^K)^2 + (s_m^C)^2 + (s_m^D)^2 + (s_m^P)^2 + (s_m^B)^2 + (s_m^O)^2 + (s_m^A)^2, \end{aligned} \tag{A.1}$$

where superscripts H, K, C, D, P, B, O, A correspond to payment methods cas$H$, chec$K$, *C*redit card, *D*ebit card, *P*repaid card, *B*ANP, *O*BBP, and *A*ccount-to-account, respectively.

The highest concentration is obtained when a merchant is paid with only one payment method (100 percent). For example, $H(100, 0, 0, 0, 0, 0, 0, 0) = H(0, 0, 0, 0, 0, 0, 0, 100) = 100^2 = 10,000$. The lowest concentration for eight payment methods is obtained when a merchant receives payments that are equally divided among the eight payment instruments—in this case, $\text{HHI} = 8(\frac{100}{8})^2 = 1,250$. Therefore, with eight payment instruments, all concentration levels must be in the range $1,250 \leq \text{HHI}_m \leq 10,000$.

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Type	Services provided by merchant type
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, online shopping
6	General services: hair dressers, auto repair, parking lots, laundry or dry cleaning, etc.
7	Arts, entertainment, recreation
8	Utilities not paid to the government: electricity, natural gas, water, sewer, trash, heating oil
9	Gas, taxis, airplanes, delivery
10	Telephone, internet, cable or satellite TV, video or music streaming services, movie theaters
11	Building contractors, plumbers, electricians, HVAC, etc.
12	Professional services: legal, accounting, architectural services; veterinarians; photographers or photo processors
13	Hotels, motels, RV parks, campsites
14	Rent for apartments, homes, or other buildings, real estate companies, property managers, etc.
15	Mortgage companies, credit card companies, banks, insurance companies, stock brokers, IRA funds, mutual funds, credit unions, sending remittances
16	Can be a gift or repayment to a family member, friend, or co-worker. Can be a payment to somebody who did a small job for you.
17	Charitable or religious donations
18	Hospital, doctor, dentist, nursing homes, etc.
19	Government taxes or fees
20	Schools, colleges, childcare centers
21	Public transportation and tolls

Table 1: Classification of 21 merchant types.

Source: The 2019 Diary of Consumer Payment Choice.

Merchant	Obs	Avg.Val	Med.Val	Med.Income	Med.Income.w
1. Grocery store	2,207	37	19	65,000	70,000
2. Gas station	1,239	26	23	65,000	65,000
3. Restaurant/bar	866	32	25	84,500	83,268
4. Fast food/coffee shop	1,600	11	8	80,000	80,000
5. General merchandise store	1,937	68	28	72,000	76,000
6. General service	391	89	26	80,639	95,255
7. Art/entertainment	355	66	20	75,000	75,000
8. Non-government utility	433	113	84	65,000	65,000
9. Taxi/airplane/delivery	76	105	15	130,000	125,000
10. Phone/internet/cable	461	99	75	60,000	58,199
11. Contractor/plumber/electrician	34	252	160	97,500	95,000
12. Professional service	101	301	60	75,000	75,000
13. Hotel/motel/campsite	43	186	137	100,000	100,463
14. Rent	131	799	385	43,818	48,000
15. Mortgage/insurance/credit card	1,059	504	201	71,400	75,000
16. Person-to-person	452	127	25	70,000	65,000
17. Charitable/religious donation	285	77	25	65,000	60,974
18. Hospital/doctor/dentist	231	152	40	70,000	80,000
19. Government taxes	109	621	90	70,000	55,322
20. School/college/childcare centers	110	210	50	85,000	95,877
21. Public transport/tolls	149	8	4	85,000	85,000

Table 2: Sample statistics on payments made to 21 merchant types.

Source: Author's computations from the 2019 Survey and Diary of Consumer Payment Choice.
Notes: The table displays information on 12,269 payments made by 2,564 respondents. Obs are the number of observations (payments). All other values are in USD. "w" refers to weighted statistic.

	In-person payments			Remote payments		
Merchant	Obs	Avg.Val	Med.Val	Obs	Avg.Val	Med.Val
1. Grocery store	2,125	36	19	80	74	45
2. Gas station	1,179	25	22	60	51	25
3. Restaurant/bar	853	32	25	13	27	27
4. Fast food/coffee shop	1,541	11	8	59	16	14
5. General merchandise store	1,417	67	24	519	71	39
6. General service	321	87	24	70	96	56
7. Art/entertainment	223	45	20	132	102	30
8. Non-government utility	64	97	79	366	115	87
9. Taxi/airplane/delivery	34	64	14	42	139	17
10. Phone/internet/cable	51	92	74	409	99	75
11. Contractor/plumber/electrician	15	393	195	18	129	111
12. Professional service	61	394	60	40	158	57
13. Hotel/motel/campsite	32	170	121	11	235	200
14. Rent	66	978	430	62	635	300
15. Mortgage/insurance/credit card	86	531	263	971	502	200
16. Person-to-person	354	64	20	98	357	64
17. Charitable/religious donation	187	55	20	98	120	39
18. Hospital/doctor/dentist	136	141	40	95	169	43
19. Government taxes	46	739	25	63	535	117
20. School/college/childcare centers	54	154	28	55	263	95
21. Public transport/tolls	98	7	6	51	8	2

Table 3: Sample statistics on in-person and remote payments by merchant type.

Source: Author's computations from the 2019 Survey and Diary of Consumer Payment Choice.
Notes: The table displays information on 12,255 payments made by 2,562 respondents. Obs are the number of observations (payments). All other values are in USD.

Merchant	Cash	Check	Credit	Debit	Prepaid	BANP	OBBP	Acct2acct	HHI
16. Person-to-person	71.8	13.8	2.5	5.0	0.0	1.2	1.0	4.8	5,394
13. Hotel/motel/campsite	18.6	2.3	62.8	16.3	0.0	0.0	0.0	0.0	4,559
9. Taxi/airplane/delivery	5.5	0.0	56.2	32.9	5.5	0.0	0.0	0.0	4,295
4. Fast food/coffee shop	43.0	0.2	23.0	30.9	2.9	0.1	0.0	0.0	3,339
3. Restaurant/bar	32.9	0.7	37.7	27.9	0.7	0.0	0.0	0.0	3,290
1. Grocery store	30.6	1.2	27.7	37.7	2.2	0.2	0.4	0.1	3,129
17. Charitable/religious donation	38.8	38.5	6.5	5.8	0.4	6.1	3.2	0.7	3,114
2. Gas station	29.1	0.6	31.2	35.9	2.2	0.6	0.4	0.0	3,114
5. General merchandise store	18.5	2.4	37.1	36.5	2.3	1.3	1.9	0.1	3,068
11. Contractor/plumber/electrician	11.8	47.1	20.6	8.8	0.0	2.9	8.8	0.0	2,941
7. Art/entertainment	39.2	4.5	32.0	17.7	0.6	2.1	3.9	0.0	2,917
21. Public transport/tolls	39.1	0.0	33.0	10.4	11.3	4.3	1.7	0.0	2,882
15. Mortgage/insurance/credit card	1.4	12.5	3.2	9.0	0.1	39.0	29.0	5.8	2,644
6. General service	38.0	9.6	24.5	22.1	0.5	1.6	3.5	0.3	2,639
14. Rent	18.0	36.9	2.7	13.5	0.9	16.2	10.8	0.9	2,260
19. Government taxes	20.9	35.2	11.0	14.3	0.0	15.4	2.2	1.1	2,240
All merchants	27.0	6.3	24.9	27.8	1.8	6.0	5.4	0.8	2,232
18. Hospital/doctor/dentist	7.5	21.7	28.8	27.4	1.3	5.3	7.1	0.9	2,187
8. Non-government utility	3.5	22.9	6.1	15.1	1.2	19.9	30.5	0.7	2,131
12. Professional service	18.2	23.2	30.3	15.2	0.0	5.1	8.1	0.0	2,109
10. Phone/internet/cable	2.7	7.3	18.7	31.0	1.8	19.1	18.2	1.1	2,072
20. School/college/childcare centers	28.7	26.7	5.0	11.9	1.0	14.9	11.9	0.0	2,067

Table 4: Percentage share of payment volume by merchant type sorted by HHI.

Source: Author's computations from the 2019 Survey and Diary of Consumer Payment Choice.
Notes: The table displays information on 11,868 payments made by 2,543 respondents.

Merchant	Cash	Check	Credit	Debit	Prepaid	BANP	OBBP	Acct2acct	HHI
19. Government taxes	0.9	77.5	1.1	2.9	0.0	16.9	0.4	0.3	6,306
9. Taxi/airplane/delivery	0.5	0.0	75.1	24.2	0.3	0.0	0.0	0.0	6,217
13. Hotel/motel/campsite	2.1	0.5	74.3	23.1	0.0	0.0	0.0	0.0	6,059
11. Contractor/plumber/electrician	2.8	74.3	11.1	5.3	0.0	0.5	6.0	0.0	5,723
12. Professional service	4.3	71.4	11.3	5.9	0.0	2.2	5.0	0.0	5,306
14. Rent	6.4	68.8	1.8	5.1	0.7	12.8	4.4	0.0	4,990
7. Art/entertainment	21.3	7.7	57.4	10.7	0.1	0.7	2.1	0.0	3,925
16. Person-to-person	23.8	55.8	1.8	3.6	0.0	0.4	1.1	13.5	3,876
3. Restaurant/bar	20.3	0.6	51.2	27.5	0.4	0.0	0.0	0.0	3,785
1. Grocery store	13.4	2.3	33.1	47.1	2.2	0.4	1.4	0.1	3,501
15. Mortgage/insurance/credit card	0.3	10.2	1.5	3.6	0.0	35.5	43.3	5.6	3,286
4. Fast food/coffee shop	33.5	0.3	26.4	37.6	2.1	0.1	0.0	0.0	3,235
2. Gas station	18.1	2.2	37.0	38.6	1.4	1.9	0.7	0.0	3,201
17. Charitable/religious donation	8.2	49.7	9.8	2.5	0.1	18.2	8.5	3.0	3,053
5. General merchandise store	7.5	13.6	45.4	26.9	1.3	1.4	3.9	0.0	3,045
21. Public transport/tolls	30.3	0.0	43.2	5.9	5.4	13.3	1.9	0.0	3,025
18. Hospital/doctor/dentist	1.8	27.6	40.9	21.2	0.2	3.3	4.6	0.4	2,923
20. School/college/childcare centers	5.0	34.9	1.9	4.2	1.5	34.5	18.0	0.0	2,781
6. General service	18.7	27.3	36.1	12.3	0.6	0.9	3.8	0.4	2,564
10. Phone/internet/cable	2.4	9.1	12.9	29.6	1.2	23.6	20.3	1.0	2,100
8. Non-government utility	2.4	21.0	6.9	17.4	1.2	21.9	27.7	1.4	2,051
All merchants	5.9	22.7	15.0	13.0	0.5	19.0	20.9	3.0	1,751

Table 5: Percentage share of payment dollar value by merchant types ordered by HHI.

Source: Author's computations from the 2019 Survey and Diary of Consumer Payment Choice.
Notes: Based on 11,868 payments made by 2,543 respondents. Obs are the number of observations (payments). All other values are in USD.

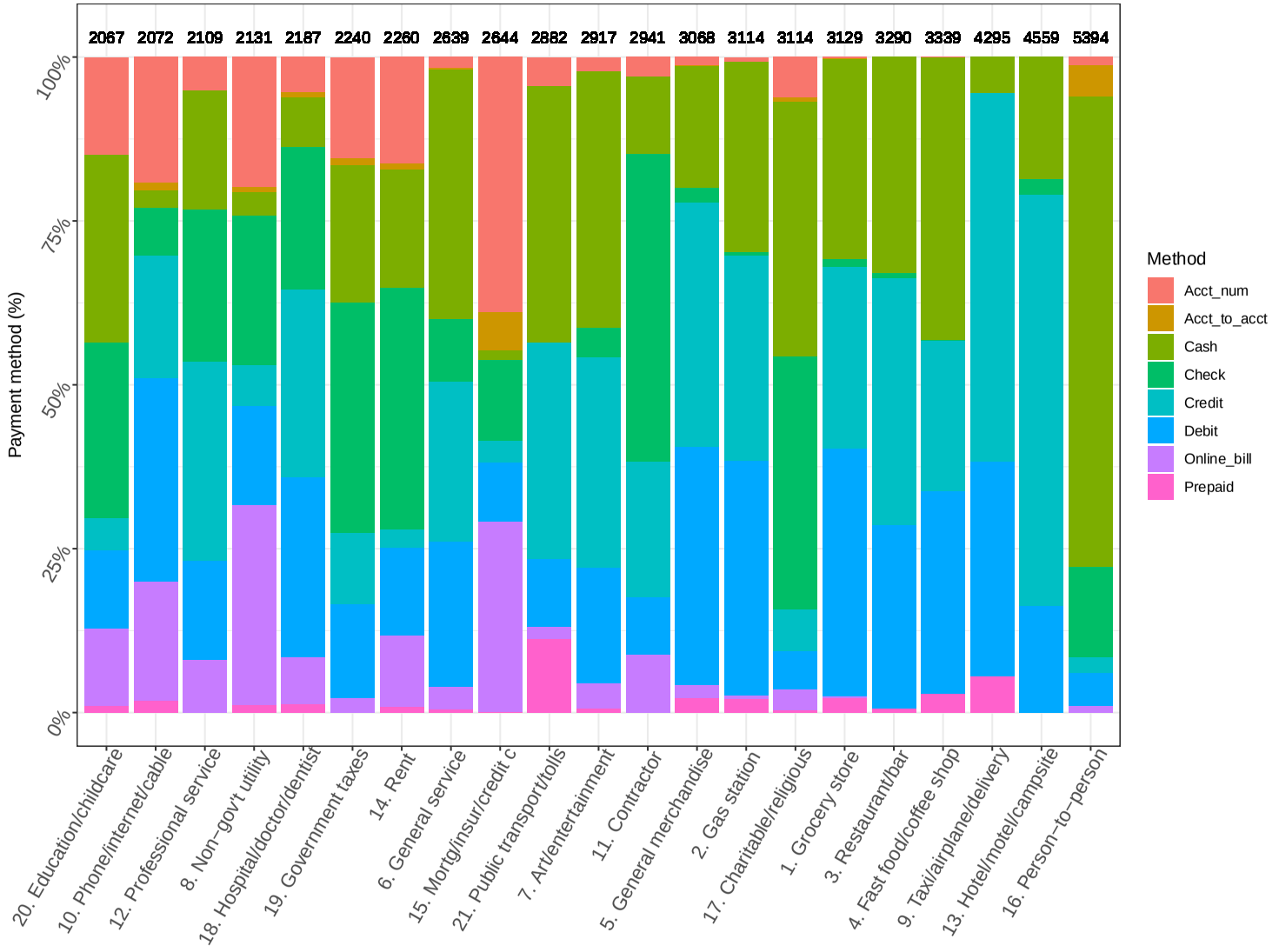

Figure 1: Share of payment volume by merchant type.

Source: Author's computations from the 2019 Diary of Consumer Payment Choice.
Note: Based on 11,868 payments made by 2,543 respondents. Merchants types are sorted from low to high payment concentration (HHI displayed on top).

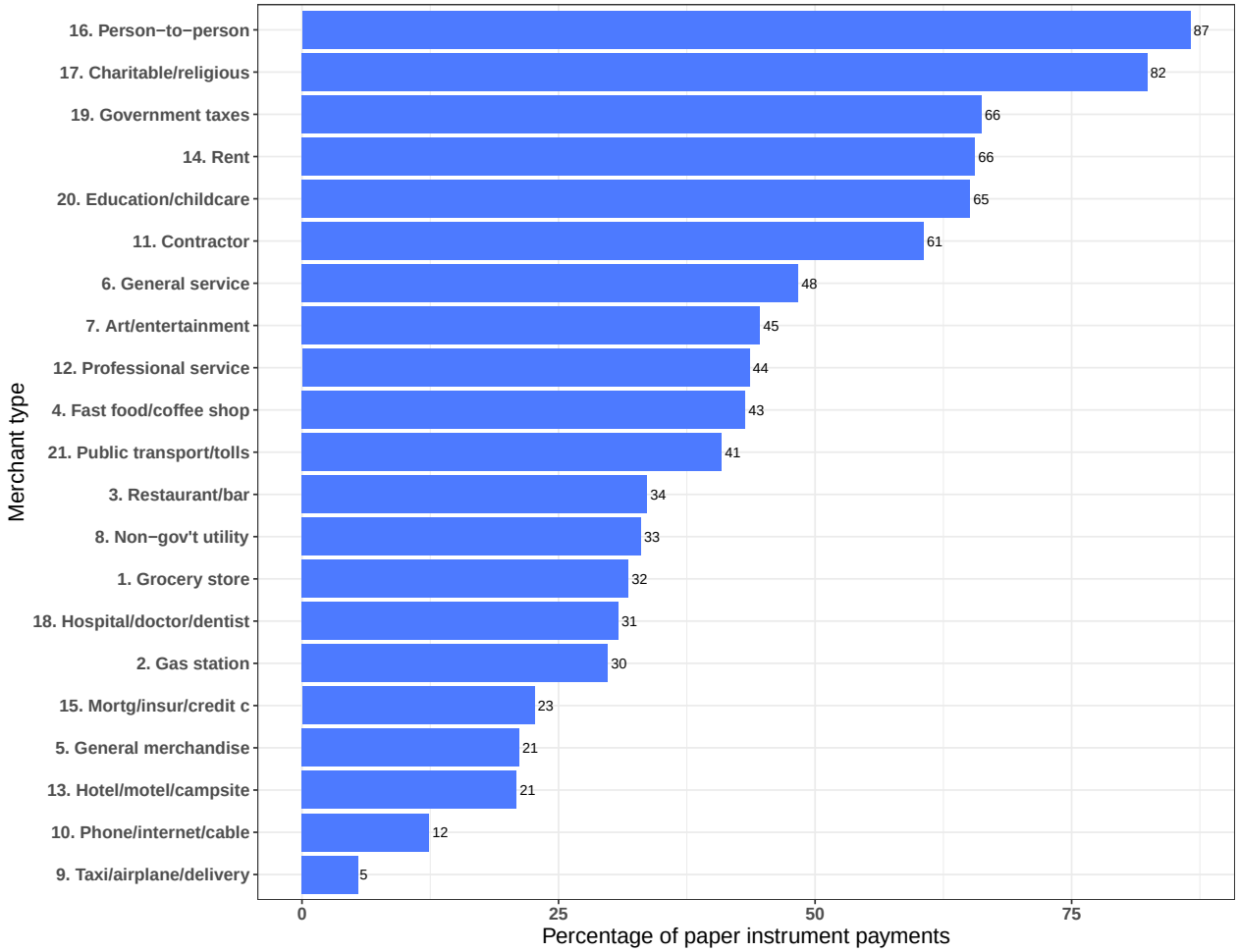

Figure 2: Percentage share of paper instrument payments by merchant type.

Source: Author's computations from the 2019 Diary of Consumer Payment Choice.
Note: Based on 11,868 payments made by 2,543 respondents.

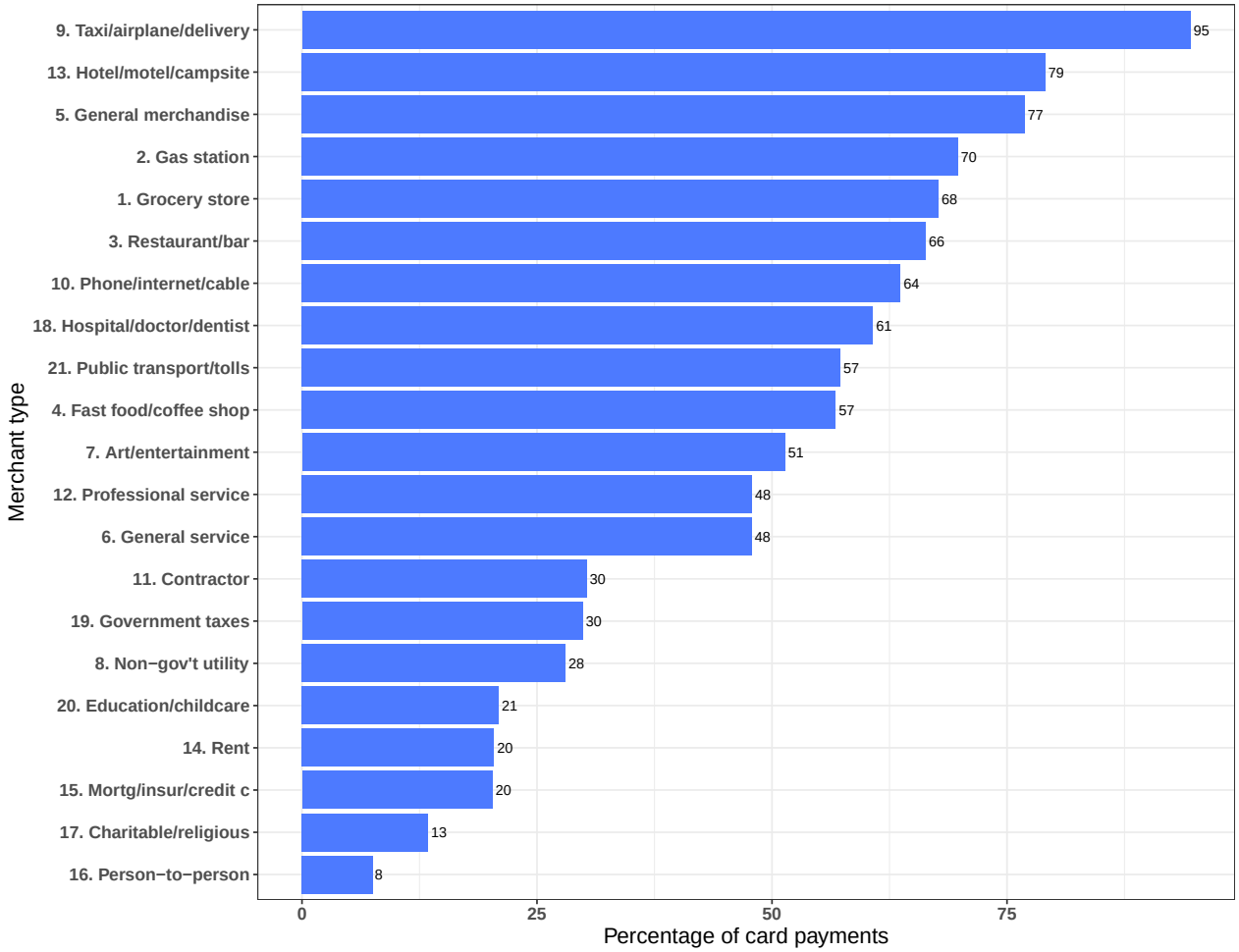

Figure 3: Percentage share of card payments by merchant type.

Source: Author's computations from the 2019 Diary of Consumer Payment Choice.
Note: Based on 11,868 payments made by 2,543 respondents.

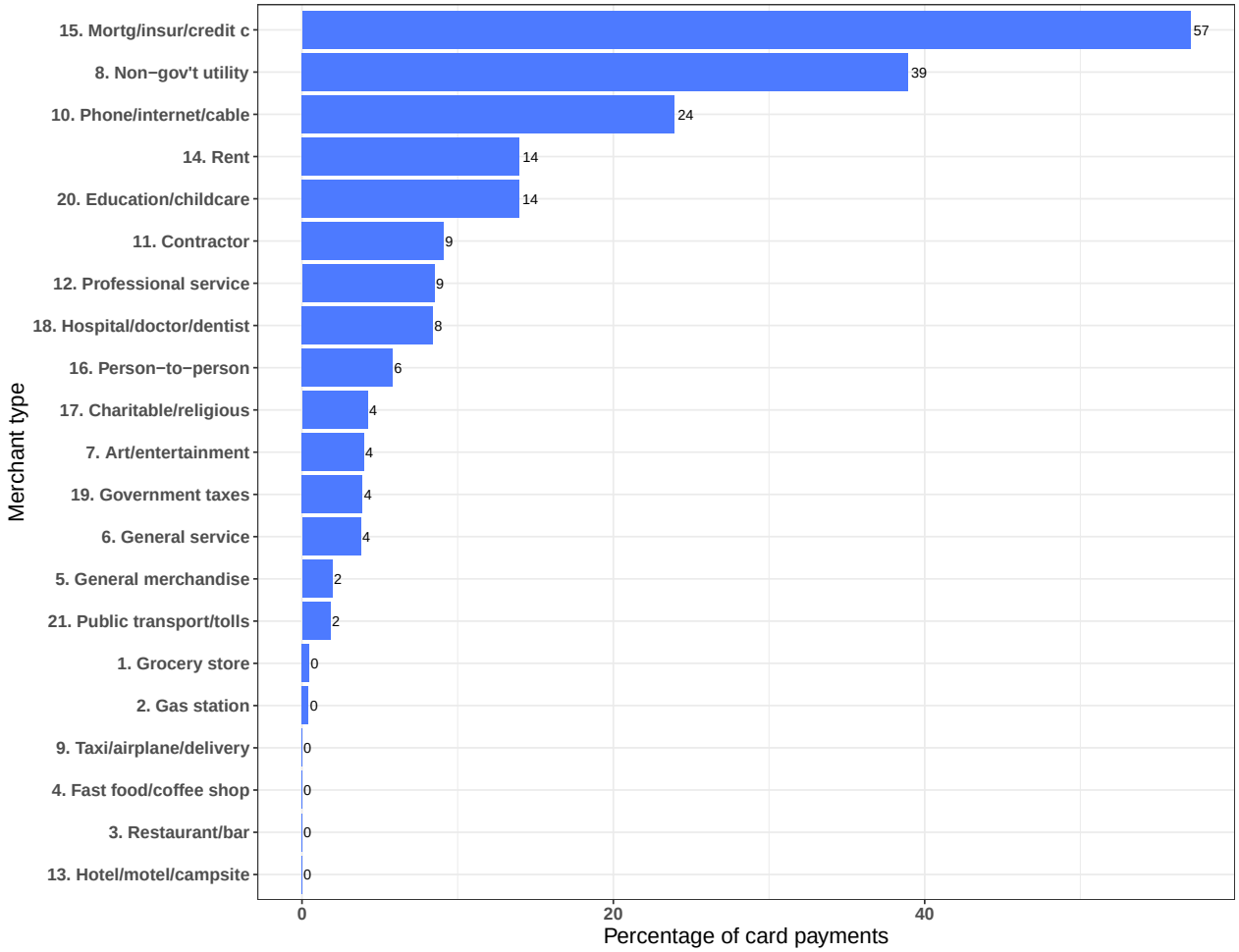

Figure 4: Percentage share of electronic payments by merchant type.

Source: Author's computations from the 2019 Diary of Consumer Payment Choice.
Note: Based on 11,868 payments made by 2,543 respondents.

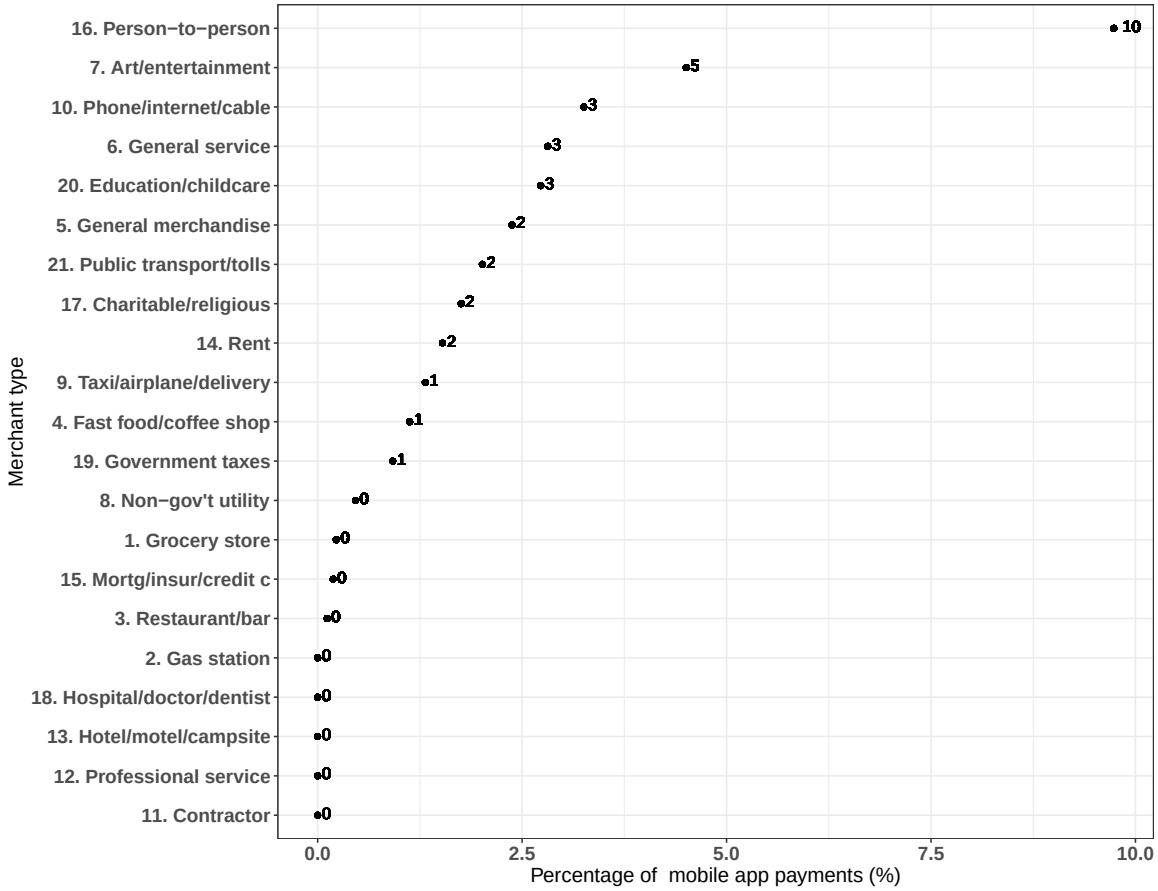

Figure 5: Percentage share of mobile app payments by merchant type.

Source: Author's computations from the 2019 Diary of Consumer Payment Choice.
Note: Based on 12,043 payments made by 2,553 respondents.