Rewarding the Rich:
Cross Subsidies from Interchange Fees

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"Rewarding the Rich: Cross Subsidies from Interchange Fees"

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INTRODUCTION

As a non-partisan advocacy organization dedicated to strengthening working families by promoting common-sense public policy solutions, the Hispanic Leadership Fund is pleased to present this critical research into the cross-subsidy effect of the interchange fees, often called 'swipe fees' that retailers make to payment card networks for processing consumer purchases.

Every time a credit card is used to pay for goods or services across the United States, a fee is charged to the business that takes the card. These fees amount to more than $130 billion each year. This study shows that rewards programs offered by the credit card industry and funded by these fees disproportionately benefit higher income earners at the expense of lower-income Americans. Credit card interchange and the shifting of benefits to higher income cardholders, entrench the existing credit card system, suppress competitive payment alternatives, and reduce the efficiency of the U.S. economy.

The size of debit card interchange fees has been limited in the U.S. since passage of the 'Durbin Amendment' as part of the Dodd-Frank financial reform of 2010. Credit card interchange fee rates, however, have not been capped. These fees have been growing historically.

The original research underpinning this study includes a survey of more than 2400 U.S. consumers and their spending patterns and credit card usage as well as analysis of transaction data. The data and analysis unmasks some of the hidden problems with credit card swipe fees. Today's card industry systematically makes life more financially difficult for lower income Americans and hurts the economy.

Since retailers usually charge the same price regardless of payment method, payment card rewards programs with different levels of rewards effectively cause some customers to subsidize the consumption of others. **The research presented confirms that households with income less than $75,000 per year collectively transfer over $3.5 billion to those making more than $75,000 per year.**

Furthermore, the cost of interchange fees to retailers can be significant, especially in competitive sectors such as gasoline and groceries. This study demonstrates that interchange costs are typically about 17 to 19 percent of retailer profit. Variance in these costs may induce risk-averse retailers to set higher prices, thus generating additional economic inefficiencies and hurting retail consumers.

Negative impacts on low income and minority households and small businesses have become "entrenched" and are likely to get worse as interchange fees continue to increase. This economic inefficiency will not change unless there is a "sufficiently large shock" in the form of policy or technology to change the dynamics of the monopolies holding sway over the credit card system.

We thank Efraim Berkovich and Zheli He for their outstanding research and analysis.

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EXECUTIVE SUMMARY

Credit card networks charge interchange fees to businesses when customers pay with credit cards. These fees fund card rewards to certain customers, and these rewards are not equally distributed in the U.S. population. The unequal rewards structure creates a transfer of wealth between customers. Retailers raise prices to compensate for the large cost of these fees, and since customer cards vary in their level of interchange fees, retailers face variation in their operating costs from month to month. The significant size of these interchange costs to businesses and the risk from their variance creates inefficiency in the economy.

The study finds:

1) Lower income Americans are losing money to higher income individuals.
    - American families earning less than $75,000 per year send a total of $3.5 billion to families earning more than $75,000 per year
    - More than $1.9 billion of that money goes into the pockets of those making more than $150,000 per year.
    - Families making less than $20,000 per year pay more than $1.2 billion of the $3.5 billion that gets transferred to higher income people

2) Black families are disproportionately harmed by today's credit card schemes.
    - The average American Black family pays nearly $60 per year to subsidize higher income people's rewards through these fees
    - Black families in the United States lose more than $1 billion each year from these transfers

3) The current swipe fee structure drives up shelf prices for all Americans regardless of how you pay.
    - The study found that swipe fees cost some retailers between 17 and 19 percent of annual profit.
    - Annual variation in interchange costs drives profit up and down by about 4.5 percent for smaller stores. This added risk generates economic inefficiency, and the entire economy suffers from this unneeded risk.

Interchange fees, rewards, and credit card usage have all been rising historically, exacerbating the wealth transfer and the operating risk to businesses. Higher rewards entrench the current payment system because customers are effectively paid to use credit cards rather than some other, potentially more efficient, payment method. The higher nominal prices, regressive wealth transfers in the population, and the harms to businesses, particularly small businesses, produced by this self-reinforcing network monopoly are going to get worse over time unless a policy intervention or new technology changes the structure of payment market.

1 Overview

U.S. consumers use payment cards–that is, credit and debit cards–for 55% of payment transactions.[1] Retailers pay interchange fees, also called swipe fees, to financial service providers such as card networks and banks in order to process these transactions. The size of debit card interchange fees has been limited[2] in the U.S. since passage of the Durbin amendment as part of the Dodd-Frank financial reform of 2010. Credit card interchange fee rates, however, have not been capped. These fees are significant and have been growing historically.

While some portion of interchange fee revenue compensates financial service providers, such as banks, for actual processing costs and for losses such as fraud, a portion of interchange fee revenue from credit cards funds so-called "rewards" programs to card holders. Credit card rewards take the form of points or miles which card holders can redeem for cash or various goods and services. Credit card providers use these rewards to induce consumers to use their specific card for transactions rather than some other payment method.

Since retailers usually set a single price regardless of payment method, the variation in rewards creates different effective prices for different consumers and therefore implies that some consumers subsidize other consumers.[3] Our survey data shows that rich consumers tend to get higher

[1] See Coyle et al. (2021) which reports findings from the 2020 Diary of Consumer Payment Choice. Payment cards' share of payments remained stable at 51% and 54% in 2018 and 2019.

[2] For banks with assets over $10 billion.

[3] In a single price regime, a cross-subsidy can be absent only if consumers with different levels of rewards purchase entirely different baskets of goods and services or shop at

rewards than poorer consumers–for instance, we find the top 18% of the U.S. population by income has average rewards rates of 2.55% while the bottom quartile has average rewards rates of 0.89%. Furthermore, higher rewards do not appear to be related to higher consumer demand, so retailers do not gain additional income from higher interchange costs.

Although the inter-household cross-subsidy arises regardless of whether retailers fully pass-through interchange fees in prices, the economic burden of interchange (in excess of rewards received) is borne by consumers when there is full pass-through. Whether retailers pass-through increased interchange fees to consumers via higher prices has been well investigated. The interchange fee cap in Australia in 2003 resulted in price declines larger than the fee reduction (see Reserve Bank of Australia Annual Report, 2005, pages 10-11). The prior work, Berkovich (2012), finds that profit margins for convenience store retailers are steady and uncorrelated with increased interchange fee costs over time, implying that revenues increase to offset costs. Using a new dataset of retail stores over the last ten years, we perform a similar analysis on stores segregated by size quintiles. We find that larger stores appear to be fully passing through interchange costs while the smaller stores absorb much of these costs, at least at the year time frame.

The cost of interchange fees to retailers can be significant, especially in competitive sectors such as gasoline and groceries. In our retailer dataset, we find that interchange costs typically subtract about 17 to 19 percent from retailer profit. Variance in these costs may induce risk-averse retailers to set prices higher and generate additional economic inefficiencies. We find that

separate retailers.

the annual standard deviation of interchange costs is about 4.5 percent the size of profits for smaller stores and about 3.8 percent for larger stores in our data. The standard deviation and implied risk may be higher, if retailer budgeting is at a higher frequency (quarterly or monthly) than the annual rate we measure.

1.1 Inefficient equilibrium

Payment technology has improved retail markets by providing a level of security[4] and convenience. This value-added service likely increases total economic surplus even when some costs are assessed by the payment card network and when payment card costs to individual merchants and to consumers are not equal to the direct benefit each receives. Economic theory explains that two-sided markets such as payment cards can benefit from asymmetric fees. Specifically, merchants pay more than the direct benefit of the payment service to the merchant in order to induce consumers to use the payment method preferred by merchants. By paying to create this positive externality of network effects, merchants' higher costs produce greater total economic welfare, and merchants can set higher nominal prices without affecting demand. This well-known positive externality of network effects is a reason for policymakers to allow some level of asymmetric pricing.

The open question is what is the right level and structure of interchange. We identify two effects resulting from the current interchange regime. First, the distribution of rewards in the population is regressive, with higher in-

[4]While handling physical cash provides opportunities for theft (from both consumers and retailers), fraud in electronic payments continues to be a serious issue for retailers.

come households receiving more rewards. Our analysis suggests that (1) this distribution results in regressive cross-subsidies within the U.S. population and that (2) there is no offsetting benefit to merchants (via some form of price discrimination) since rewards do not appear correlated with higher demand. Second, we find that individual merchants face a variance in interchange fee costs. Theory suggests that this variance induces merchants to self-insure by setting prices higher, thus transfering some of that risk cost onto consumers.

We hypothesize that rewards and, therefore, interchange fees rise over time because card issuers compete for customers primarily on the basis of rewards rate. This "network effects natural monopoly" locks in a sub-optimal equilibrium because consumers find it harder to switch away from generous rewards in order to use some other, possibly superior, payment method. Due to this market structure, rewards continue to rise over time. Rising rewards rates and a wider dispersion of rewards rates increase the deleterious effects we describe. Without policy intervention, new and potentially more economically and socially efficient payment methods will have difficulty supplanting the current payment market equilibrium.

Policies have been enacted to reduce payment card fees. The Durbin amendment to the 2010 Dodd-Frank financial reform passed by the U.S. Congress set a limit on debit card interchange for cards issued by larger banks. Credit card interchange has not been capped and rewards have increased. Remedies such as allowing merchants to impose price discounting depending on payment method do not appear to have been effective. The behavioral finance literature has offered that the lack of real-world effect of

these policies may be due to consumers' confusion about multiple pricing of the same commodity and their worry that something not-above-board was happening (*e.g.*, when discounts for cash payments are offered). Stronger policy interventions [5] may be needed to restructure and reduce interchange fees in order to move to a more efficient economic outcome.

1.2 Related literature

Two-sided markets and, particularly, interchange fees have been well studied. Rysman and Wright (2014) provide a good survey of the payment market field and the relevant theoretical models. The concept of two-sided markets as applied to payments is well known; Rochet and Tirole (2003) describe the two-sided credit card market where one side (merchants) pays for card network use by the other side (consumers). Armstrong (2006) explains that "competitive bottlenecks" in a two-sided market can create monopolistic outcomes. Applying that concept to the case of credit cards rewards, consumers are incentivized to single-home (*i.e.*, use a single platform of credit cards with rewards) so that potentially multi-homing merchants (*i.e.*, willing to accept various forms of payment) are forced to go along with the monopolist platform.

Regressive cross-subsidy effects in payment cards have been noted by Carlton and Frankel (1994), who point out the cross-subsidy between cash and credit card users. Hayashi (2009) hypothesizes that payment rewards result in cross-subsidization and thus deteriorate social welfare and its distri-

[5] In Litan and Baily (2009), Nicholas Economides discusses the improvement in economic efficiency from a cap on interchange fees in Australia in 2003 as described in the Reserve Bank of Australia Annual Report, 2005.

bution. Empirical work, Berkovich (2012) and Schuh et al. (2010), measured cross-subsidy effects.

Wang (2010) describes a sub-optimal payment market outcome, similar to our contention that interchange fees rise inefficiently, and explains that, in the mature payment card market, positive externalities from extensive margin use of cards are small while negative effects from intensive margin (that is, more credit card payments volume) arise. The interchange system has the potential to increase economic efficiency via various forms of price discrimination (see, for example, Wang and Wright (2017)), but this theoretical efficiency is produced from lower effective prices on poorer consumers. However, current payment markets produce the reverse outcome; it is richer consumers who pay lower effective prices.

2 Consumer behavior

We use a January 2022 survey of 2410 U.S. consumers to estimate economic transfers due to credit card rewards programs. The survey samples across different economic and age ranges and oversamples individuals identifying as Black or Hispanic so that we have a more robust estimate of rewards distribution in those smaller groups. We ask questions about spending on gasoline, groceries, and total expenditures and about use of credit cards and associated rewards. We compare some of our measurements to the Federal Reserve's Diary of Consumer Payment Choice (DCPC) which asks consumers about related topics but, unfortunately, does not ask about size of rewards.

2.1 Rewards

In the survey, respondents were asked to estimate the average rewards rate they receive (*e.g.,* as cash back or points) for their credit card purchases. Table 1 shows some summary demographic statistics for our card rewards survey.[6]

Most consumers use credit cards for at least some purchases: 86% of the respondents in our 2022 survey compared to the 75% and 78% in the 2019 and 2020 DCPC surveys. Out of the 2075 respondents in our survey that have at least one credit card, 82% earned rewards for one or more of their credit cards versus 72% and 73% in the 2019 and 2020 DCPC surveys. Our survey questions asked respondents with a rewards credit card to estimate the amount of rewards they receive, on average, from purchases completed with the card. Some existing card rewards programs are straightforward, for example, 2% cash back on all purchases, while other programs involve different rewards for different categories of spending, various maximum rewards limitation, and other complications. We ask respondents to provide a single rewards rate in order to simplify our measurements.

Some banks offer rewards as an initial bonus to open the account. For our calculation of inter-group transfers, we ignore the potential effect of these awards under the assumption that it is small on average over time. We also do not account for unredeemed rewards, which are an implicit transfer to the bank. We take the approach that rewards to card-holders are the scope of cross-subsidy, whether or not that consumer "donates" their money to the

[6]Ethnic groups add up to more than 100% because respondents from different ethnicity and racial backgrounds can identify themselves as of Hispanic or Latino origin or descent.

Demographic	**Samples (%)**
Income	
less than $35k	798 (33%)
$35-50k	454 (19%)
$50-100k	782 (32%)
$100K+	376 (16%)
Gender	
Male	1281 (53%)
Female	1129 (47%)
Region	
Northeast	425 (18%)
Midwest	512 (21%)
South	960 (40%)
West	513 (21%)
Age	
18-34	859 (36%)
35-49	553 (23%)
50-64	446 (18%)
65-74	356 (15%)
75+	196 (8%)
Ethnicity	
White	1134 (47.1%)
Black	697 (28.9%)
Hispanic	668 (27.7%)
Asian	79 (3.3%)
Other	43 (1.8%)

Table 1: Summary demographics statistics of consumer survey.

bank. We acknowledge that if banks rely on reward abandonment to reduce operating costs, then the cross-subsidy measurement ought to account for this transfer.

Table 2 shows the average rewards rate for various demographic groups. The largest difference in rewards rates is related to income. Higher-income respondents have a higher rewards rate. For example, the average rewards rate for respondents whose total household income was $150K or more in 2021 was 2.55% while the average rewards rate for those whose total household income was less than $20K was 0.89%, a difference of 1.66 percentage points without controlling for other covariates. In other words, the average rewards rate received by the top income group was almost 3 times higher than the bottom income group.

Using these data, we estimate a linear OLS regression predicting the rewards rate from respondent demographic variables. We include respondents who do not have a credit card and assign them a zero rewards rate since the goal is to estimate expected rewards based on demographic variables. Some respondents (343 individuals) claimed to use a credit card with rewards but were uncertain about the amount or type of card rewards they receive. A logit regression finds the only differentiating characteristic of respondents who claimed to receive rewards but did not specify them is gender. We, therefore, drop these "uncertain rewards" observations from our estimation of rewards rate because this group has no distinguishing variables (of those we are using) which could affect the rewards prediction regression. In other words, if this group has a different rewards distribution, it would have to be related to some variable which we do not measure. Table 3 shows the

Category	Average Rewards Rate
Income	
less than $20K	0.89%
$20K-$35K	1.18%
$35K-$50K	1.48%
$50K-$75K	1.82%
$75K-$100K	1.94%
$100K-$150K	2.29%
$150K or more	2.55%
Gender	
Male	1.79%
Female	1.36%
Age	
18-21	1.61%
21-24	1.75%
25-34	1.88%
35-49	1.59%
50-64	1.36%
65-74	1.32%
75-84	1.56%
85+	1.24%
Education	
less than high school	0.89%
high school or GED	1.26%
some college, associate degree, or community college	1.49%
technical/vocational training after high school	1.24%
college graduate	2.02%
post-graduate	1.93%
Ethnicity	
White, Caucasian, European-American, European	1.52%
Black, African-American, Caribbean-American, African	1.65%
Asian, Asian-American	1.54%
Hispanic or Latino origin or descent	1.82%
Other	0.77%

Table 2: Average rewards rates in various demographic groups. Source: 2022 Survey

results of the rewards prediction regression.

Controlling for other covariates, higher-income respondents have a higher rewards rate. For example, respondents whose total household income was $150K or more in 2021 had rewards rates that were on average 1.4 percentage points higher than respondents whose total household income was less than $20K. Controlling for other covariates, female respondents reported rewards rates that were on average 0.4 percentage points lower than males. Older respondents aged 35 and above reported rewards rates that were on average 0.3 to 0.9 percentage points lower than respondents aged 18 to 21. Respondents who have completed 4-year college and post-graduate college reported rewards rates that were on average 0.6 and 0.5 percentage points higher than respondents who have not completed high school. Looking at just income differences, Table 4 shows the estimated average rewards rate by income group with rewards rising in income as expected from the regression.

Controlling for the other covariates, respondents who described themselves as Black had a rewards rate about 0.1 percentage points higher than Whites, although the difference is not statistically significant. Respondents who identified as Hispanic or Latino had a rewards rate about 0.2 percentage points higher than non-Hispanic respondents. We do not know whether these respondents systematically overstate rewards or whether card issuers act deliberately in favor of these minority groups. However, even with slightly higher rewards rates, these sub-groups have average rewards rates different from the U.S. population average because of the differential income distribution. Weighted by the income distribution, the Black population in the U.S. is estimated to have an average rewards rate of 1.68% and the Hispanic

Variable	$Coefficient(Std.Error)$
INCOME \$20K-\$35K	$0.222^{**}(0.106)$
INCOME \$35K-\$50K	$0.474^{***}(0.110)$
INCOME \$50K-\$75K	$0.708^{***}(0.113)$
INCOME \$75K-\$100K	$0.818^{***}(0.136)$
INCOME \$100K-\$150K	$1.044^{***}(0.146)$
INCOME \$150K or more	$1.362^{***}(0.196)$
GENDER Female	$-0.377^{***}(0.070)$
AGE 21-24	$0.043(0.180)$
AGE 25-34	$-0.004(0.158)$
AGE 35-49	$-0.341^{**}(0.159)$
AGE 50-64	$-0.556^{***}(0.165)$
AGE 65-74	$-0.646^{***}(0.175)$
AGE 75-84	$-0.453^{**}(0.214)$
AGE 85+	$-0.913^{***}(0.293)$
EDUCATION high school	$0.141(0.234)$
EDUCATION some college	$0.344(0.231)$
EDUCATION vocational training	$0.175(0.257)$
EDUCATION college	$0.604^{**}(0.239)$
EDUCATION post-graduate	$0.487^{*}(0.256)$
ETHNICITY Black	$0.107(0.083)$
ETHNICITY Asian	$-0.317^{**}(0.152)$
ETHNICITY Hispanic or Latino	$0.184^{**}(0.083)$
ETHNICITY other	$-0.779^{***}(0.191)$
Constant	$0.161(1.059)$
Observations	2067

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Selected results of OLS regression predicting card rewards rate from demographic variables.

Variable	
INCOME $20K-$35K	0.290***(0.108)
INCOME $35K-$50K	0.587***(0.110)
INCOME $50K-$75K	0.924***(0.110)
INCOME $75K-$100K	1.051***(0.125)
INCOME $100K-$150K	1.392***(0.138)
INCOME $150K or more	1.657***(0.181)
Constant	0.893***(0.080)
Observations	2067

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Estimated rewards rate by income group in U.S. population.

population to have an average rewards rate of 1.88% while the U.S. average rate is 1.79%.

2.2 Spending

To investigate whether merchants use card rewards to price discriminate consumers who have heterogeneous demand, which increases social welfare, our survey asked respondents about their household spending on gasoline, groceries and in total in the past month. Figures 1, 2, and 3 show average monthly spending on these categories by income group. In the charts, the seven income groups correspond to households who make annually 1) less than $20K; 2) $20K-$35K; 3)$35K-$50K; 4)$50K-$75K; 5)$75K-$100K; 6)$100K-$150K; 7) $150K or more. As expected, we find that average monthly spending on gasoline, groceries and total spending increase with income.

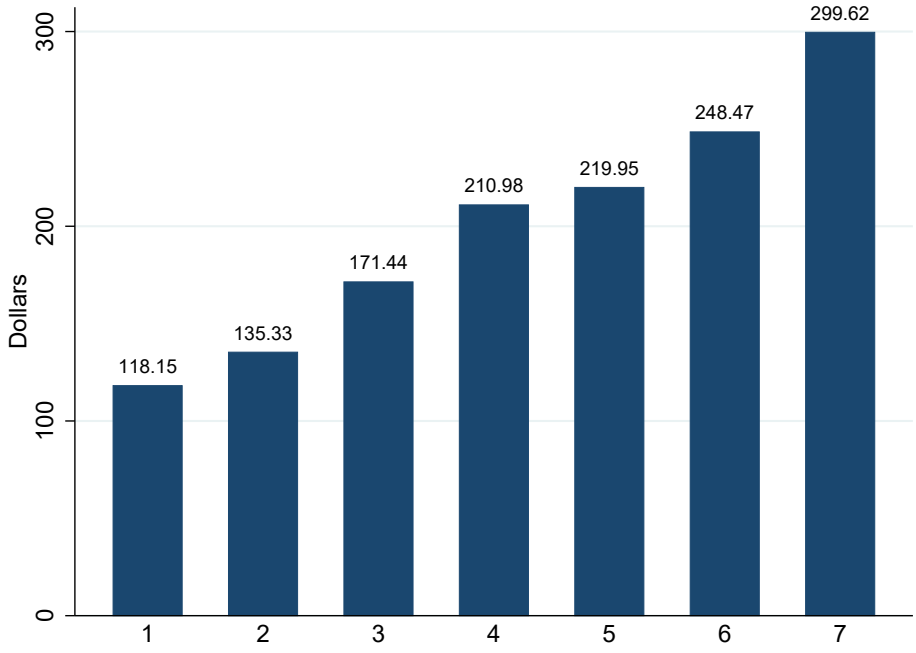

Figure 1: Average monthly spending on gasoline by income group. Source: 2022 survey.

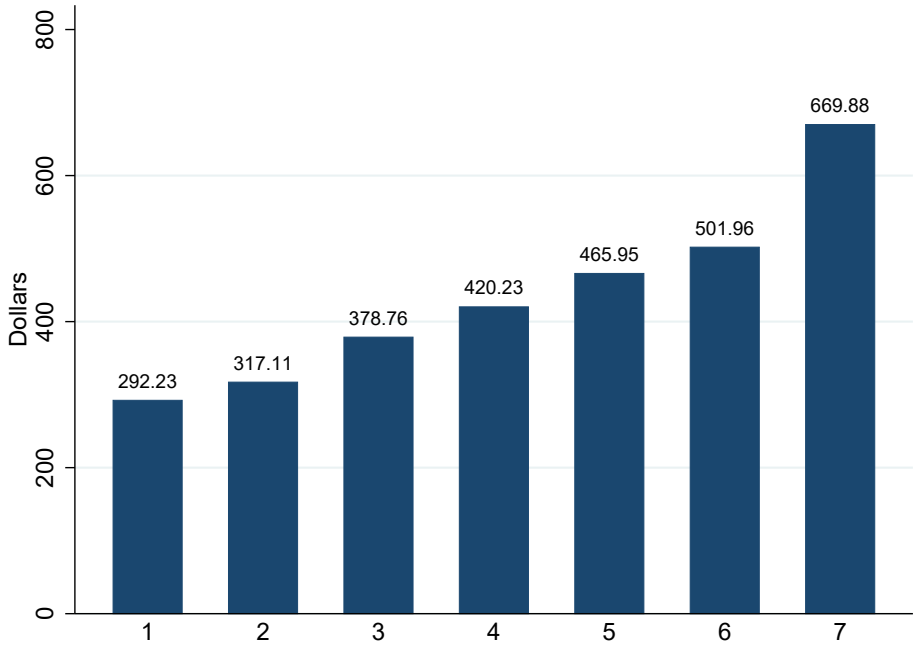

Figure 2: Average monthly spending on groceries by income group. Source: 2022 survey.

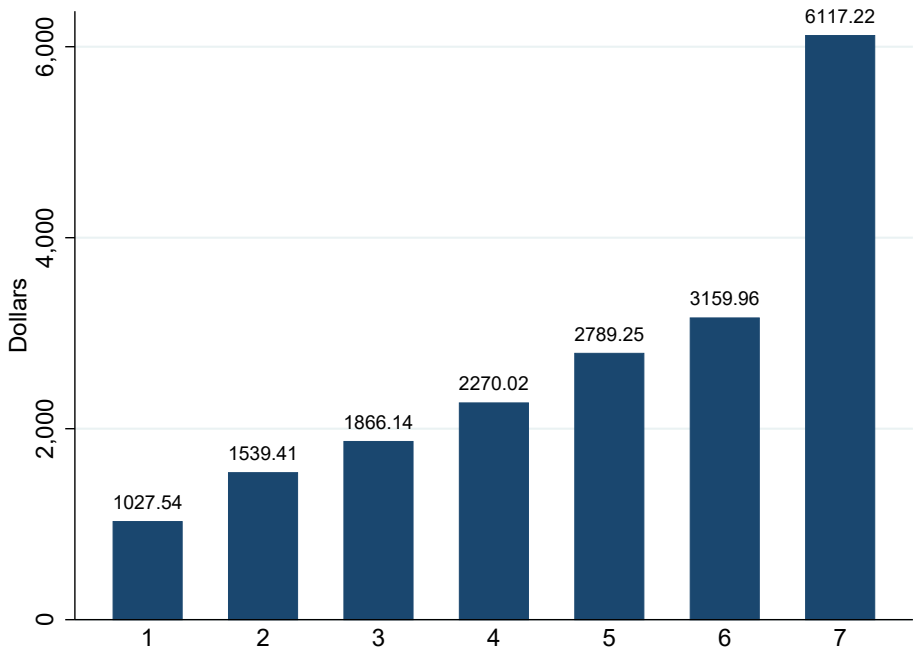

Figure 3: Average monthly total spending by income group. Source: 2022 survey.

With a linear regression model, we investigate whether higher rewards rates correlate with increased nominal spending on these categories. With the dependent variable being dollars spent and controlling for other covariates, we cannot reject the null hypothesis that rewards rates have no effect on total spending and spending on groceries, that is, there is no strong statistical basis to think rewards are related to total spending or spending on groceries. However, we do find that higher rewards are correlated with higher spending on gasoline: a 1 percentage point increase in rewards rate is related to increased gasoline expenditures of $8.55 per month.

Economic theory suggests that more elastic demand would lead to higher

	Coefficient	Std. Error	P value
total spending rewards rate	-57.73	39.93	0.148
spending on groceries rewards rate	-6.16	4.53	0.174
spending on gas rewards rate	8.55	2.86	0.003

Table 5: Estimated dollar change in spending for a 1% point change in rewards rate. Other regression coefficients are not shown.

quantity purchased as real price declines, due, in this case, to implicit discounts from nominal prices by card rewards. Grocery demand is known to be fairly inelastic. The lack of statistically significant correlation with total spending may be due to behavioral factors which reduce the theoretical effect on demand. It may also be that demand becomes more inelastic with income, so the collinearity of higher rewards rates and income may be reducing the measured effect.

Gasoline demand, at least in the short run, is also found to be inelastic. Using different estimation methods and datasets, the literature finds a short-run demand elasticity that mostly falls between 0 and -0.4.Hughes et al. (2008) find that the short-run gasoline demand became more inelastic in the past decades from –0.21 to –0.34 between 1975 and 1980 to –0.034 to –0.077 between 2001 and 2006. Using leads and lags of gasoline taxes to separate out the variation in gasoline prices that is not driven by demand, Coglianese et al. (2017) find a short-run demand elasticity of –0.37. Levin et al. (2017) find short-run demand elasticities that range from –0.27 to –0.35 using data on daily credit card purchases of gasoline. In the long run, if gasoline prices increase, consumers may switch to other transportation

modes, for example, by taking the bus rather than driving, or move for a shorter commute. As a result, gasoline demand is more elastic on longer timescales. However, it is likely that this elasticity is one-sided, meaning that below a certain price point, consumers do not purchase significantly more gasoline.

We note that even the statistically significant correlation between rewards and gasoline spending does not necessarily imply causality from rewards to spending. For example, individuals who spend more on gasoline may deliberately obtain cards with higher rewards for gasoline purchases, that is, the causality runs from spending to rewards.

We estimate the average dollars of rewards each income group receives from their credit card spending. The amount of card rewards received depends on both rewards rates and purchases made using credit cards. Figure 4 shows the percentage of spending on gasoline and groceries by credit card across income groups and Figure 5 shows that of total spending. We find in Section 2.1 that rewards rates increase with income. We also find that higher income groups use credit cards more when they buy gasoline and groceries. They also use credit cards to pay for more of their overall spending and, therefore, are more likely to receive rewards on these purchases.

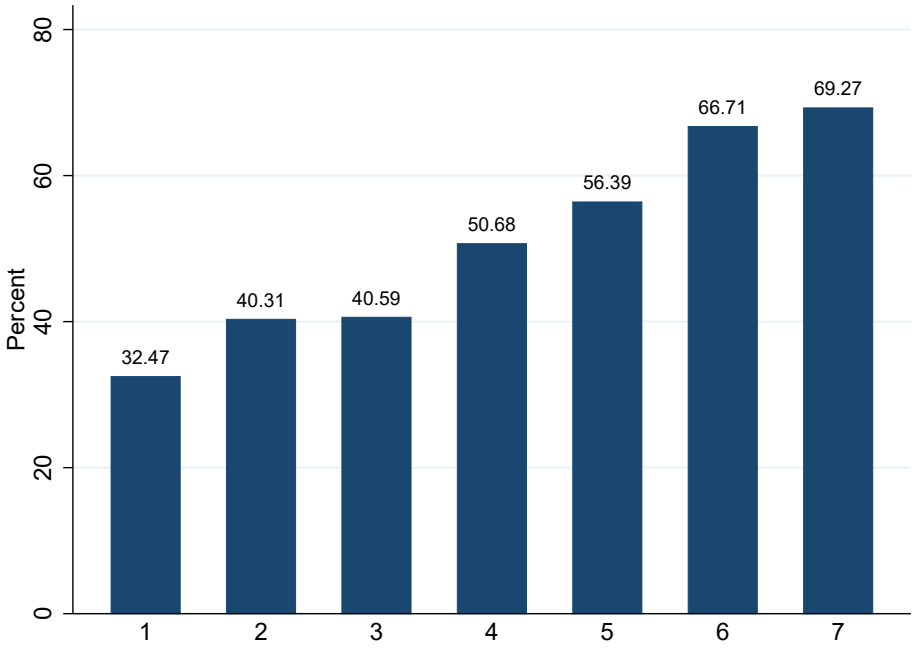

Figure 4: Credit card use on gasoline and groceries by income. groups Source: 2022 survey.

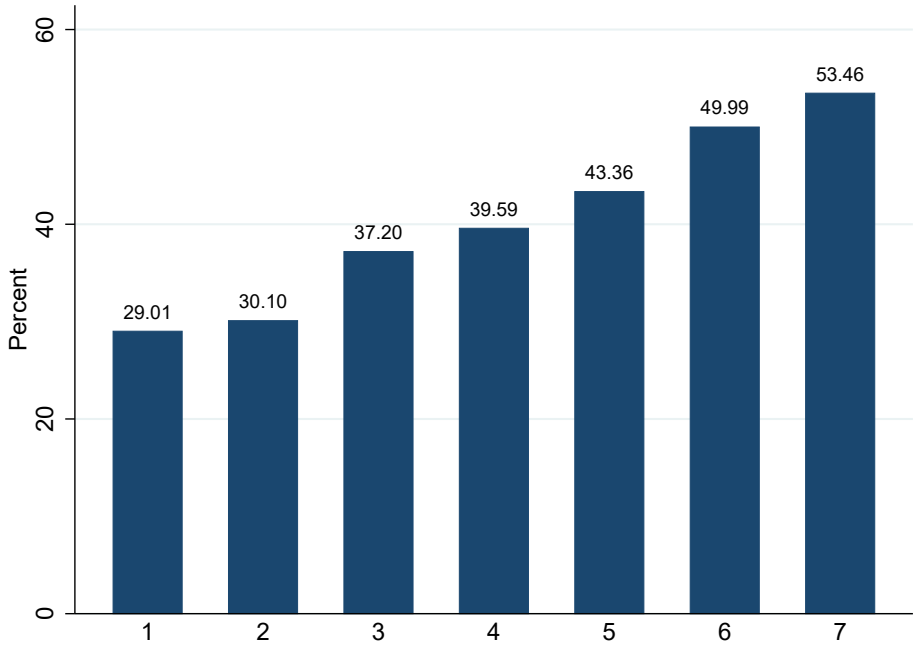

Figure 5: Credit card use on total spending by income groups. Source: 2022 survey.

Since higher-income households receive higher rewards rates on their credit cards and they use credit cards more often to pay for their gasoline, groceries and total spending, they receive higher rewards compared to lower-income households. Figure 6 shows the average dollar rewards each income group receives from credit card spending on gasoline and groceries and Figure 7 shows those from total credit card spending. The differences are stark: the lowest-income group receives on average $1.66 rewards from their monthly spending on gasoline and groceries versus $17.45 for the highest-income group. These differences widen further when we compare rewards from their monthly total credit card spending: $3.39 rewards versus $60.28.

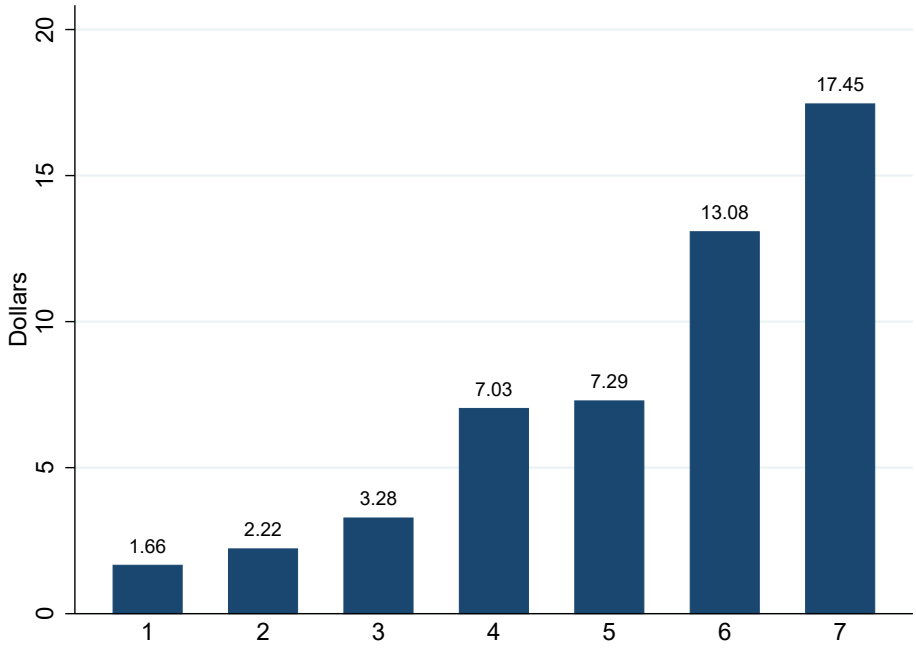

Figure 6: Average monthly rewards from credit card purchases on gasoline and groceries by income group. Source: 2022 survey.

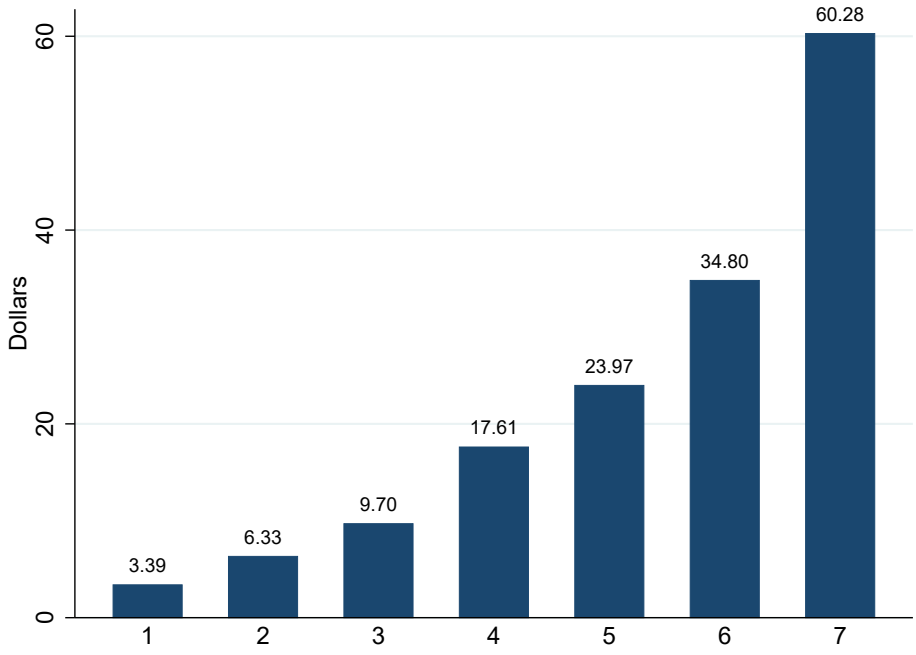

Figure 7: Average monthly rewards from total credit card purchases by income group. Source: 2022 survey.

2.3 Annual fees and interest costs

The mechanism of cross-subsidy operates through rewards funded by interchange fees. However, if some portion of rewards costs to banks are funded directly from the card-holder, then that cross-subsidy is attenuated. Some credit cards charge annual fees. These fees may pay for certain non-reward card amenities but can also subsidize the provision of card rewards– that is, annual fees "self-pay" some rewards. To measure the effective cross-subsidy more accurately, we adjust for these sources of bank revenues.

Figure 8 shows the average annual fees paid by consumers on their credit cards by income group. Annual fees for all credit cards held by credit card

holders averaged $55.39 in our sample with 63% reporting zero annual fees.

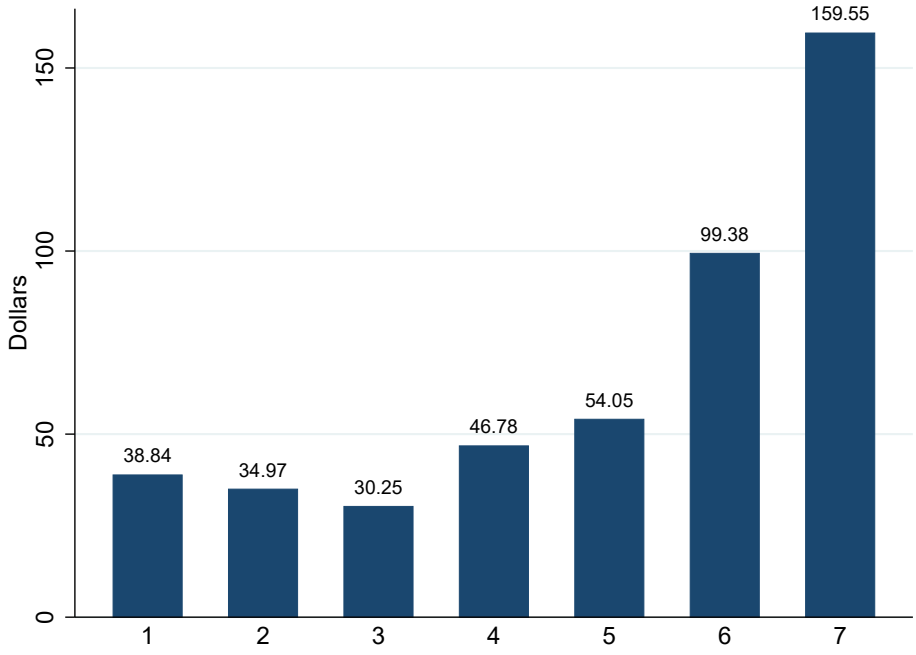

Figure 8: Average annual fees by income group. Source: 2022 survey.

For card holders, annual fees are slightly higher for the bottom end of the income distribution and are also higher at the top end. It may be that card issuers charge lower-income households higher annual fees in order to compensate for either lower interchange revenue from their smaller volume of purchases or to offset other potential costs such as higher default rates. Cards for richer households may include higher value services, such as access to travel lounges. It may also be the case that card issuers use high annual fees with generous rewards to separate the market into high spenders for whom the annual fee amortization makes the card worthwhile and moderate spenders who would choose a low or zero annual fee card. For the cross-

subsidy adjustment from annual fees, we assume that the entirety of the fee goes to self-pay for rewards.

Out of the 2075 respondents who have at least one credit card, 806 of them sometimes carry a balance from month to month. Table 6 reports the percentage of credit card holders who carry a balance by rewards rates. It shows that consumers who receive higher rewards rates are in general less likely to carry a credit card balance compared to those who receive lower rewards rates. To further verify this finding, we also estimate a linear OLS regression predicting the rewards rate from a binary variable of whether the consumer carries a balance, controlling for other demographic variables. We find the coefficient to be around -0.4 and statistically significant, which implies that carrying a credit card balance is correlated with a rewards rate that is 0.4 percentage points lower.

Rewards Rate	**% Who Carry Balance**
0%	53.40%
1%	41.43%
1.5%	33.93%
2%	37.77%
3%	36.36%
4%	20.90%
5%	32.62%
6%	8.82%

Table 6: Percent of consumers who carry a credit card balance by rewards rates.

The average interest rate they pay on the balance is 13.41%. The average interest rate paid by rewards credit card holders is 13.19% and that paid by non-rewards credit card holders is 14.09%.

Rewards Rate	Interest Rate	Balance
0%	14.01%	$881
1%	14.62%	879
1.5%	13.46%	348
2%	12.19%	709
3%	11.40%	343
4%	6.89%	100
5%	14.45%	551
6%	18.5%	135

Table 7: Average credit card interest rate and balance by rewards rates.

Table 7 shows the average credit card interest rate and balance of credit card holders by their rewards rates. We do not find that those who receive higher rewards rates systematically pay higher interest rates or carry a higher balance compared to those who receive lower rewards rates.

The interest received by the lender is a risky cashflow because borrowers sometimes default on their repayment obligations. We do not have data on credit card default and recovery rates correlated with rewards rate, so we cannot verify if borrowers with higher rewards rates produce higher risk-adjusted income for the bank. If higher rewards borrowers default at a lower rate (and/or have higher recovery rates in default), then their lower nominal interest rate may still produce higher effective income to the bank than the effective income from borrowers with a higher nominal interest rate but higher default rates (and/or lower recovery rates). Although a recent report from the U.S. Treasury (see (Becnel, 2021)) indicates that, in general, higher-income borrowers default less than lower-income borrowers and although we find a correlation between rewards and income, these facts

alone do not offer sufficient evidence that higher-rewards borrowers subsidize borrowing from lower-rewards borrowers.

3 Merchant operations

We use a proprietary dataset of retail stores in a particular industry[7] which contains annual revenue, profit, and interchange costs for the years 2012 to 2021. The average number of stores per year is 8433, and most stores are in the panel for all ten years. We assess (1) the variance of interchange fee costs at the store level in order to see the risk faced by retailers from this operating cost and (2) the relationship between interchange fees and store profit in order to examine whether retailers pass through interchange fees to consumers. We divide the dataset into quintiles of store size by using average net sales as the size measure.

3.1 Pass through

In an economy where investment expects to earn normal profit, theory suggests that costs, such as interchange fees, would be fully passed through in nominal prices to consumers. We validate this theory by looking at profitability of retail stores in our dataset as interchange fees change.

Interchange costs are significant in relation to EBITDA[8], a measure of profit. Stores with average net sales of less than $1.5 million spend about

[7]Because the data are confidential and restricted-use, we cannot provide more details on the composition.

[8]Earnings Before Interest, Taxes, Depreciation, and Amortization.

17 percent of profit on interchange fees[9]. Stores with average sales above $5.2 million spend about 19 percent of profit.

Net Sales	**EBITDA (avg.)**	**Interchange (avg.)**
less than $1.5 million	$64K	$13K
between $1.5 and $2 million	$168K	$18K
between $2 and $3.2 million	$214K	$27K
between $3.2 and $5.2 million	$247K	$57K
more than $5.2 million	$486K	$114K

Table 8: Net sales, average EBITDA, and average annual interchange costs.

Since interchange fee costs are stochastic, it may take some time for a retailer to update their estimate of expected interchange costs and then to update consumer prices. We take the approach that this update occurs within a year so that we look at the concurrent annual relationship between profitability (as measured by the ratio of EBDITA to net sales) and the ratio of interchange fee costs to net sales. We perform a regression to predict the profitability ratio from the interchange ratio and account for store and year fixed effects. A coefficent close to zero on the interchange ratio implies that interchange costs and retailer profitability have little effect on one another, implying that retailers must be fully passing through interchange costs to consumer prices. Table 9 shows the results.

[9]Assuming EBITDA would be $77 thousand ($64K + $13K) if interchange fees were zero.

Net Sales	Coefficient	Std. Error	P value
less than $1.5 million	-0.69	0.12	0.000
between $1.5 and $2 million	-0.44	0.14	0.001
between $2 and $3.2 million	-0.98	0.13	0.000
between $3.2 and $5.2 million	-0.30	0.14	0.038
more than $5.2 million	-0.07	0.16	0.648

Table 9: Estimated percentage point change in profitability ratio for a 1 percentage point change in interchange ratio. Other regression coefficients are not shown.

The negative coefficients for stores in the bottom three quintiles suggest that those stores are not fully passing through changes in interchange costs, at least in the year time frame. Thus, a significant part of these costs are borne by these stores and not their customers. The largest quintile of stores has a coefficient which is statistically zero, implying that these larger stores may be better at passing through interchange costs than smaller stores. We note that this analysis describes pass-through of interchange *on average*.

Net Sales	Interchange/Sales	EBITDA/Sales
less than $1.5 million	1.03%	8.61%
between $1.5 and $2 million	1.01%	10.37%
between $2 and $3.2 million	1.07%	10.13%
between $3.2 and $5.2 million	1.36%	7.10%
more than $5.2 million	1.53%	6.73%

Table 10: Net sales, average annual interchange costs divided by sales, and average EBITDA divided by sales.

3.2 Variance

Interchange costs at a retailer are a source of risk because of the random arrival of customers with varying levels of interchange fees associated with

their cards. Stores face risk from (1) uncertainty about the distribution of fees in their customer population and from (2) the random arrivals of customers with varying interchange fee cards to the store within a given time interval. The risk of random arrivals affecting total interchange fees is lessened with a larger population of customers. Thus, smaller stores have higher risk, and risk increases with smaller time periods.[10]

In standard economic theory, a risk-averse firm reacts to higher variance in production costs by setting output prices higher. We make no attempt to quantify this risk-premium in retail prices, rather, we simply document the observed variance. Subsets of stores in the dataset are owned by various entities which can risk share across stores and which may have larger, external financial resources. Since we do not have information about ownership structure, our variance measurement is an estimate of the risk faced at an individual store location rather than the risk faced by an actual firm. We note that smaller firms likely have higher risk-aversion than larger firms, due, in part, to credit constraints which make absorbing temporary losses more costly. Higher risk-aversion may force smaller firms out of competitive markets due to their inability to raise prices sufficiently to compensate. This effect is in addition to the higher variance risk faced by firms with a smaller customer population.

Table 11 shows the store-level annual standard deviation in interchange costs.

[10]If stores manage budgeting at a higher frequency–for instance, quarterly or monthly–than the annual rate in our analysis, then the variance (and implied risk) is relatively greater.

Net Sales	Interchange/Sales	Std. Dev. Interchange/Sales	Std. Dev. Interchange
less than $1.5 million	1.03%	0.15%	$2901
between $1.5 and $2 million	1.01%	0.14%	$3946
between $2 and $3.2 million	1.07%	0.13%	$5412
between $3.2 and $5.2 million	1.36%	0.09%	$9462
more than $5.2 million	1.53%	0.08%	$18480

Table 11: Net sales, average annual interchange costs divided by sales, average annual standard deviation of interchange costs divided by sales, and average annual standard deviation of interchange costs in dollars.

Interchange costs for stores with less than $3.2 million in annual net sales are a little higher than one percent of sales. Larger stores face costs about a half percent higher. This difference may be due to stores with more sales having a customer composition which skews toward higher income consumers who, as we find, tend to have higher rewards cards which have higher interchange fees. The standard deviation in interchange ratio from year to year declines in store size, as expected. Across all size cohorts, a store has a probability of around 66% of incurring an interchange cost within one standard deviation of its average in a given year.

In dollar terms, interchange costs are significant in relation to profit. For instance, the average EBITDA of stores with less than $1.5 million in sales is $64 thousand, so a standard deviation of $2901 in interchange costs implies that the store faces a risk that is usually on the order of 4.5 percent of profit. For stores with sales above $5.2 million, the average store expects this risk to be usually about 3.8 percent the size of profit.

4 Cross-subsidy

Much existing research has examined whether card networks exercise monopoly power in setting interchange fees. Another line of theoretical research has pointed out that if a single price is charged to consumers for all transactions, then cross-subsidization occurs between customers who use different payment methods—cash paying and debit card customers subsidize credit card payers. The source of the cross-subsidization is that consumers generally benefit more from paying with a card versus paying with cash or check. It is generally acknowledged in the economics literature that card payments offer a variety of benefits including speed, convenience, and security. Additionally, paying with a credit card provides benefit to certain individuals over paying with a debit card. For example, some consumers benefit by earning interest on the float (in the case of credit cards). Other consumers may find their household budgeting is aided by using a debit card instead of credit. Thus, if consumers are charged the same price but receive different benefits depending on payment type, then a cross-subsidization between consumers occurs. This cross-subsidization is made more extreme when certain cards provide rewards (cash or goods/services) for card use.

We use a standard approach to cross-subsidy as in Faulhaber (1975). The intuition is straightforward: When an enterprise is constrained to normal profit and to a single retail price for a commodity, higher costs (from interchange) on sales of a commodity to certain consumers must necessarily result in offsetting higher sales margins on other consumers.

To calculate the inter-population transfers resulting from different re-

wards rates, we estimate the total annual dollars received from rewards based on household spending. We also report the amount after adjusting for the estimated annual fees paid. This adjustment assumes that the entirety of annual fees subsidize rewards. If some part of the fee pays for non-rewards services, then our rewards estimate is too low from the annual fee adjustment. Consider, if the annual fee were payment for a separate service, then no adjustment to net rewards received is warranted.

We perform the calculation of cross-subsidy received (or given) for each demographic group and weight by the group's size in the U.S. population. This analysis provides the dollar transfers for each group as well as the U.S. total. We scale by spending to calculate the average dollar rewards which would accrue to each household if there were no cross-subsidy. Under the assumptions of single price and full pass-through of costs, we calculate the per household transfer as the deviation from perfectly equitable rewards. Table 12 shows the estimated average dollar rewards received by household by demographic group and the implied cross-subsidy transfer, measured as a household average and as a group total, when there are no annual fee adjustments. Table 13 shows those after annual fee adjustments.

Rewards are increasing in income. Middle-income households ($50K to $75K in annual income) grossed about $211 annually in rewards, which is reduced to about $168 after netting out annual fees. High-income households (above $150K in annual income) grossed about $723 in annual rewards–about $567 after adjustment. The poorest households (earning less than $20K per year) effectively pay about $65 annually to subsidize consumption of richer households–for instance, households earning more than $150K an-

Demographic	Rewards per household ($)	Transfers per household ($)	Transfers per group (billions $)
Income			
less than $20K	40.68	-64.99	-1.16
$20K-$35K	75.96	-82.35	-1.33
$35K-$50K	116.40	-75.51	-1.14
$50K-$75K	211.32	-22.12	-0.47
$75K-$100K	287.64	0.80	0.01
$100K-$150K	417.60	92.64	1.84
$150K or more	723.36	94.28	2.24
Race			
Hispanic	276.34	4.67	0.09
Black	161.60	-46.32	-0.85

Table 12: Average annual dollar rewards per household by demographic group and average annual cross-subsidy transfers per household and demographic group totals.

Demographic	Rewards per household ($)	Transfers per household ($)	Transfers per group (billions $)
Income			
less than $20K	16.75	-65.12	-1.16
$20K-$35K	48.99	-73.67	-1.19
$35K-$50K	89.93	-58.76	-0.89
$50K-$75K	168.25	-12.62	-0.27
$75K-$100K	236.61	14.37	0.23
$100K-$150K	320.85	69.07	1.37
$150K or more	567.38	79.97	1.90
Race			
Hispanic	211.99	1.15	0.03
Black	102.98	-58.12	-1.07

Table 13: Average annual dollar rewards per household by demographic group and average annual cross-subsidy transfers per household and demographic group totals, adjusted for annual fees.

nually gain about $94 ($80 after adjustment). At the population level, all households earning less than $75K annually subsidize households earning more than $75K by $4.1 billion ($3.5 billion after adjustment) annually due to the distribution of rewards.

Households identifying as Hispanic did not appear to have a significant transfer to the rest of the population, meaning that the average Hispanic household does not gain or lose from the rewards distribution. The average Black household, however, subsidizes the rest of the population by about $46 annually ($58 after adjustment), a group transfer of $850 million ($1 billion after adjustment).

5 Discussion

Average interchange fee charged per transaction has been growing over time. The average rewards rate in our 2022 survey is 1.79% in comparison to the range 0.32% to 0.50% of average rewards rate in 2009 as per Berkovich (2012). Standard theoretical arguments for asymmetric prices in two-sided markets explain that particular consumers' aversion to using credit cards is due to some implicit individual costs which outweigh the benefits, and so asymmetric pricing via sufficiently high rewards induces those consumers to switch to using credit cards. Following this logic, the historical growth in credit card use may be the direct result of banks offering higher rewards. Those higher rewards provide enough of a benefit to those consumers so that they finally switch to more credit card use. Apparently, a significant portion of the population needs an offset of at least 3 percentage points of the cost

of consumption in order to overcome their credit card hesitancy. It may also be that certain consumers' preferences have been changing. According to this interpretation, these consumers' preference for payment methods other than credit cards has been increasing over time. And so, banks have raised rewards in order to keep those consumers attached to credit cards while other consumers take up more credit card use as a consequence of higher rewards. Regardless of the cause, a higher volume of credit card transactions has expanded interchange fee revenue in excess of economic growth, and very likely card network profits as well.

5.1 Market structure leads to rewards growth

We propose a possible explanation for rewards growth arising from the structure of the payment card market. Payment services by credit card is effectively a commodity product since the service provided is, for the most part, a secure transfer of money from purchaser to seller. In a commodity market, price becomes the determinant of demand. Card issuers, such as banks, compete for customers primarily on the basis of higher rewards. When selecting a card to use, consumers can more easily compare these rewards "prices" as opposed to other bundled card services.[11] Higher rewards are funded by higher interchange fees.

It is well known that *ad valorem* (that is, percentage based) markups create nominal price distortions in excess of the markup. For example, suppose a merchant's cost for an item is \$100, then a 5% interchange fee

[11]Other bundled credit card products, for instance, include various purchase-related insurances (*e.g.*, car rental), travel assistance, and purchase advisory services (*e.g.*, price comparison tools)

requires the nominal price to be $P \times (1 - 0.05) = \$100 \rightarrow P = \$105.26$ which is greater than a 5% markup to the merchant's cost. In this way, growth in interchange rates produces ever greater price distortions. Note that as interchange rates go to 100%, prices go to infinity.

Unrestricted, a Bertrand-style price competition by card issuers does not have an equilibrium since nominal prices and rewards go to infinity as interchange fees approach 100 percent. Instead, it must be that some increase in the fee level can be absorbed by retailers as they adjust consumer prices upward, while a larger level increase would disrupt the price setting equilibrium and cause defections from the network. We have in mind a price-dispersion equilibrium driven by search frictions (in this case, the distribution of interchange fees from randomly arriving consumers) in the spirit of Burdett and Judd (1983). If the distribution of consumer-linked interchange fees is stretched toward higher fees, then retailers respond by raising prices. If the induced price increases are too high, then lower rewards consumers would patronize out-of-network merchants with lower nominal prices which have not been driven higher by the increase in the interchange fee distribution.[12] In this way, the average interchange fee rises over time as card-holders switch over to higher rewards cards and merchants increase the price of goods without discouraging purchases by card-holders who have not yet switched to higher rewards cards.

[12]The scarcity of out-of-network merchants makes consumer defection more difficult. However, one can imagine that a sharp increase of interchange fees, to say 50%, would be sufficient to cause almost total defection from the network.

5.2 Network effects monopoly

An argument in favor of asymmetric fees in two-sided markets, such as the payment card market, is that asymmetry induces one side of the market to internalize positive externalities which they otherwise would not. In the case of payment cards, giving rewards to consumers at a cost to merchants provides incentive for more card use which benefits all users of the card network, merchants and consumers. A similar argument can be made for social media networks, where the benefit of the network can only be realized when the network has a large population of users who receive services paid for by costs on advertisers who, in turn, benefit from the value of the network's user population. Thus, an equilibrium with an asymmetric pricing network may produce a more efficient economic outcome than an economy without such a network.

While coordination on a particular network may be beneficial versus an equilibrium without the network, the resulting equilibrium may not be the only possible equilibrium and may be sub-optimal. Once the economy settles at this sub-optimal equilibrium, it may be difficult to move to a more efficient one. For instance, the dominant Facebook social media network may not operate for the best social welfare outcome.[13] But, given Facebook's dominance, it is difficult for another social media network to supplant it. In the case of existing dominant credit card networks, incidental regressive transfers and other economic inefficencies as described in our study may be evidence that the current equilibrium is sub-optimal. Alter-

[13]See reports such as "New whistleblower claims Facebook allowed hate, illegal activity to go unchecked", *Washington Post*, October 21, 2021.

native payment systems could potentially produce higher aggregate benefit through improved technology (perhaps some modern identity verification, fraud-reducing approach). However, the adoption of new payment systems calls for consumers to forgo increasingly generous rewards from usage of credit cards in order to gain benefit from some alternative payment method. Merchants may have difficulty offering discounted pricing for alternative payment methods due to consumer reluctance to engage with differential pricing by payment method. In this way, the payment market sub-optimal equilibrium becomes entrenched unless sufficiently large shock (policy or technological) moves the economy to a more efficient equilibrium.

6 Conclusion

Using a 2022 survey of consumer payment behavior, we estimate the cross-subsidy transfer in the U.S. from credit card rewards programs. We find that the population of households making less than $75K annually transfers $3.5 billion per year to the population of households making more than $75K. This transfer is the result of the distribution of rewards rates. Adjusting for annual fees on credit cards, this figure becomes $3.5 billion. The population of households identifying as Black transfers $850 million to the rest of the population via the rewards channel. Adjusting for annual fees, the transfer is $1 billion. Rewards rates have been rising historically, with the U.S. average rewards rate going from between 0.32% and 0.5% (Berkovich (2012)) to our current estimate of 1.79%. This growth in rewards rates, and the dispersion of their distribution, creates large regressive transfers in the

economy.

In our retailer dataset, we find that the annual standard deviation in interchange costs is 4.5 percent of the size of profits for smaller stores, and that interchange costs are typically 17 percent of profit. Although larger stores, on average, are able to pass through interchange costs to consumers, smaller stores appear to have reduced profit from interchange increases. This risk in operating costs likely produces higher retail prices and reduces economic efficiency.

Although the efficient level of interchange fee is unclear, we suggest that the current level is above efficient levels. The growth in acceptance of digital technology as part of daily life and the popularity of various digital person-to-person payment platforms (such as Venmo) argues that the positive network effects from credit card usage may not require a substantive fee asymmetry to be implemented. Perhaps more importantly, a lower interchange fee and thus lower rewards reduces the lock-in effect of the present payment card system and allows potentially welfare-increasing markets and technologies to arise.

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