Trickle-Up Wealth Transfer:

Cross-subsidization in the payment card market

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Cross-subsidization of consumers
in the payment card market

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Abstract:

Since merchants charge consumers the same price regardless of payment method, the existence of payment card rewards programs implies that some customers subsidize the consumption of others. We surveyed a cross-section of U.S. consumers and asked about spending on groceries and gasoline, payment methods, and card rewards. From our data, we estimate the total amount transferred in the U.S. due to rewards on gasoline and groceries to be about $1.4b to $1.9b. We show that these payments are inefficient regardless of the distribution of rewards in that there is little correlation between rewards rate and consumption of gasoline and groceries. In examining the actual distribution of rewards, we find that higher income consumers received a higher rewards rate. Using gasoline merchant operating statement data, we find that card costs are passed through to the consumer. Therefore, rewards amount to transfers—transfers from low income to high income consumers which have a disproportionate impact on low-income minorities, a sort of regressive tax on consumption. We discuss several policy remedies.

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Executive summary

In the United States, most consumer transactions in many retail sectors are completed with a credit or debit card. The fees paid by retailers who participate in these transactions to the banks that process these transactions are a significant percentage of the retailers' profit or, in many cases, more than the retailers' profit. These interchange fees have been the subject of governmental and academic scrutiny recently.

Much existing research has examined whether banks 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. This cross-subsidization is made more extreme when certain cards provide rewards (cash or goods/services) for card use.

To study this market distortion, we conducted a telephone survey of a cross-section of U.S. households and asked about spending on gasoline and groceries. We also asked about payment card and cash use. From our data, we estimate the total money transferred through rewards in the U.S. due to gasoline and groceries is about $1.4b to $1.9b. Because spending on groceries and gasoline has limited correlation with rewards rate, these payments are inefficient financial activity regardless of rewards distribution within society. This money is paid from non-rewards consumers to rewards consumers. In our study, we look at the distribution of rewards within the population and find that rewards are not distributed equitably, thus adding another social welfare implication to this market distortion. We find that

- card rewards accrue disproportionately to wealthier households even after adjusting for spending,
- education increased household rewards,
- white households get higher rewards than African-American and Hispanic households, and
- households without a bank account received lower rewards.

Because of the difference in rewards rates amongst different population groups, the current structure of the credit card system forces lower income and minority consumers to transfer hundreds of millions of dollars to higher income consumers. Our estimates focus exclusively on rewards transfers and do not account for the full range of transfers from poor to rich consumers resulting from all interchange fees charges. We also do not consider any transaction execution or other benefits credit card users get over those who do not use cards.

Using gasoline retail merchant data, we show that changes in card fees charged to merchants do not translate into lasting changes in profit, implying that the surplus from card fees accrues to the bank/card scheme and, to a limited extent, rewards card holders. In other words, the data shows that lower interchange fees result in lower prices for consumers and higher interchange fees result in higher prices for consumers. Interchange fees function as a price wedge in the market and create price differentials amongst consumers depending on the payment method the consumers use.

We give a brief overview of several potential policy remedies, though this area requires further study. One clear direction amongst the various remedies, however, is the *de facto* elimination of rewards paid for by merchants via interchange fees and transferred via higher prices to other consumers.

Introduction

In the payments market, banks charge fees for electronic payment use. The market is two-sided because both payment receivers (merchants) and payment givers (consumers) can be charged fees (which can be negative, implying a subsidy). As in many two-sided markets, one side (merchants) pays a cost in excess of the benefit received.

Bank fees (whether in three-party schemes like American Express or interchange fees in four-party schemes like Visa and MasterCard) vary significantly. Food stores pay smaller fees than clothing stores. Debit cards have lower fees than credit cards. And even the type of credit card makes a difference—if a credit card offers rewards, the fees are higher than on a basic card. For June 2009, the National Association of Convenience Stores documented 121 different fee levels for Visa and MasterCard ranging from about 4.5% to 0.5%. Moreover, fees have not been stable. Bradford and Hayashi (2008) state that Federal Reserve studies show annual growth from 2003 to 2006 was about 18 percent for debit cards and 5 percent for credit cards—in excess of the rate of inflation. Since it seems improbable that transaction costs have increased, the increase must be due to some other driver.

In this report, we do not analyze the efficiency of card fees but, instead, focus on a harmful side-effect of the current pricing regime—subsidization of certain consumers at the expense of others. The cross-subsidization effect is of current interest as Congress takes up banking and credit card reform (see, for example, "Rich and Poor Should Pay Same Price" by Floyd Norris, *New York Times* Oct. 1, 2009). The cross-subsidization effect is well-known in the industry. At the ninth annual Chicago Federal Reserve Bank payments conference in May 2009, some participants argued that consumers who use lower-cost payment types, such as cash or cards without rewards, subsidize others by bearing a disproportionate share of payment costs (see Jacob, *et al.* (2009)). We describe and measure these cross-subsidies.

Rewards cards benefits and costs

Because they are simply transfers of money between merchants and consumers, card rewards programs are not necessarily an inefficiency in the market. At best, however, if every consumer received the same rewards and paid the same amounts with cards, then all consumers would face the same net prices and these programs would be neutral, regardless of the rewards' size. In the real economy, transfers of money carry a cost, and banks collect fees for all moneys transferred.

When in a single-price regime, if consumers derive greater benefit from using cards than other payment methods, then subsidization occurs even without rewards. Clearly, if all consumers pay the same amount for identical goods, but some receive greater benefit by paying with a card, then there is a transfer of surplus to the cardholders. For the U.S., we find that the transfer due to rewards on gasoline and groceries gained by rewards card holders from all other consumers is about $1.4b to $1.9b.

As it happens, only a minority of consumers pay with rewards cards. Those consumers who pay using other methods effectively face net higher nominal prices. For this situation to be socially efficient, it must be that non-rewards card payers derive a benefit from using other payment methods over rewards cards. The existence of non-rewards cards seems to cast doubt on the contention that the market is socially efficient since credit cards provide essentially the same ease of payment benefits with and without rewards.

It may be that certain consumers will spend more, if offered a subsidy (by means of a rewards card). This type of argument is sometimes made in favor of rewards cards. On closer examination, this line of reasoning does not seem rigorous. From a merchant's perspective, lowering prices across the board for a relatively untargeted group of consumers seems suboptimal. In fact, merchants already have multiple targeted discount systems in place to attract buyers to specific products (*e.g.* coupons, customer loyalty cards, quantity discounts, *etc.*) These discounts are typically available to all consumers on an equal basis without regard to socio-economic status or race. General purpose rewards cards force merchants to essentially engage in discounting based upon the factors chosen

by card issuers (which we find to be income-related) versus the merchant best practice of targeted discounting.

Survey and results

We conducted a telephone survey of a cross-section of U.S. households derived from Census tract data that stratified the U.S. by household income. We asked about spending on gasoline and groceries. We also asked about payment card and cash use. We find that card rewards accrue disproportionately to wealthier households even after adjusting for spending. We also find and discuss other features of the rewards rate distribution across different population groups. Because of the difference in rewards rates amongst different parts of the population and because rewards do not appear to correlate with changes in spending behavior, rewards cards serve as a mechanism for cash transfers between different population groups. We conservatively estimate the size of these transfers to be in the hundreds of millions of dollars.

Our study of gasoline merchant data indicates that merchants do not capture the price differential implied by interchange fees. These results are consistent with economic theory suggests that competitive markets lead to normal profits for merchants in those markets. Gasoline and grocery retail markets are among the most competitive, so we hypothesize that any change in profit due to the price differential from interchange fees is likely to be temporary and that any transfers accrue to the card scheme and rewards customers.

Related literature

The area of card fees has been well researched. We cite just a few of the related works here. Rochet and Tirole (2003) and Guthrie and Wright (2007) describe the two-sided credit card market where one side (merchants) pays for card network use by the other side (consumers). Garcia-Swartz *et al.* (2006) detail the costs and benefits of various payment methods and find that electronic payments provide greater overall benefit than checks and cash. Carow and Staten (1999) analyze the consumer's payment option to use debit, general purpose credit cards, gasoline credit cards, or cash. They find consumers are more likely to use cash when they have less education, lower incomes, are middle-aged, and own

fewer credit cards. Debit and credit card users are younger, more educated, and hold more credit cards. Hayashi (2008) investigates market forces that cause payment card rewards and hypothesizes that payment rewards result in cross-subsidization and thus deteriorate social welfare and its distribution.

Data

We gathered telephone survey data on payment method usage from a cross-section of consumers in the U.S. stratified by income. We specifically asked about spending on gasoline and groceries. Other questions asked about card rewards and annual fees.

Survey data is less precise and more biased than actual billing and receipts data, so we view this study of a cross-section of all U.S. consumers stratified by income as an important step, but not the final measurement, of surplus transfers. Of course, although there are limitations to survey data, a telephone survey in which we ask about spending patterns is an effective and practical way to examine the cross subsidization issue. Telephone surveys have some advantages over other methods. The great majority of all American households have a telephone, even those in the lowest income quartile. Asking about spending habits and payment choices is a good method to examine purchasing behavior as we cannot directly observe and monitor individual spending. Even if we could somehow obtain a household's entire actual billing and receipt data by way of more accurately measuring behavior, we still could not have accurately accounted for cash spending, which is an especially highly used payment method for the poor. Therefore, a survey is a good way to estimate household cash spending.

There are other limitations or sources of error in our methodology. Selection bias is an issue in telephone surveys (and other types of surveys as well). Otherwise eligible consumers were excluded if they did not claim to have knowledge of household spending on gasoline and groceries as well as of their payment card use. On the other hand, if consumers who did not know about their household spending habits were included in the study, systematic measurement error would increase. As a result, screening out unknowledgeable consumers of groceries and gasoline is necessary. Since much of our

data is self-reported (*e.g.* spending, card-use), it is subject to unknown random, measurement error.

The survey sample consists of 803 responses. Some statistics for the sample are shown in the table below.

Category	Number samples (%)
Income (by Census tract):	Top 10: 101 (13%) 10-25: 100 (12%) 25-50: 201 (25%) 50-75: 201 (25%) 75-100: 200 (25%)
Gender	Male: 334 (42%) Female: 469 (58%)
Region	Northeast : 156 (19%) Midwest + Farm: 206 (26%) South: 269 (34%) West: 170 (21%)
Age	18-24: 30 (4%) 25-34: 58 (7%) 35-49: 198 (25%) 50-56: 253 (32%) 65+ : 246 (31%)

We oversampled the top 10% of the population by income because we assumed they would be most likely to have card rewards and we wanted to get a more precise measure of rewards rates.

Survey data was collected by PSA Interviewing. We obtained merchant data on payments and profits from a sample of gasoline retailers from the CSX database. We looked at aggregated quarterly operating statements from 2000Q4 to 2009Q3 (which is a partial quarter in our data). Other sources of data are noted when used.

Consumer payment behavior

We estimate the rewards rate consumers received and look for correlations between rewards rates and demographic group. We find that income is the biggest determinant of rewards but that there are some effects from education, race, and marital status. Spending on groceries and gas appears to be mostly insensitive to the rewards rate, implying that rewards for purchases on those categories are effectively transfers.

Rewards rate and distribution

Respondents were asked whether they received points, miles, cash back, or other rewards on any of their credit or debit cards. Of the 607 respondents who had credit cards, approximately 51% did get rewards, 46% said they did not, and 3% did not know. Respondents were asked to describe their rewards and were given some suggested answers as guidance. The canned answers were: (a) 1 point or mile per dollar (25% or 89 samples), (b) 2 points or miles per dollar (3% or 10 samples), (c) 1% cash back (17% or 63 samples), and (d) 2% cash back (5% or 18 samples). From this data, we estimate a "rewards rate." Cash back rewards translate to a rewards rate exactly equal to the cash back percentage— for instance, 1% cash back translates to a 1% rewards rate. Points or miles are more difficult to translate into a rewards rate because these can be restricted rewards—miles are generally redeemed for travel. The cash value of these rewards often depends on the amount accumulated and time redeemed. In general, the value does approach a rewards rate of 1%. As an admittedly *ad hoc*, but we hope conservative, estimate, we assign a rate of 0.9% to each point or mile—so 2 points per dollar translates to a rewards rate of 1.8% percent. Approximately 39% (141 samples) claimed to have card rewards but did not know what they were or did not answer. Trying to guess at a single rate for this large sub-sample seems problematic. Instead, to get a rewards rate, we assign rewards rates of 0%, 0.5% and 1% to this group and provide analysis for each of these numbers.

The remaining 11% (40 samples) claimed other rewards rates with 2% claiming a rewards rate of 5%. Some cards do actually offer rewards of 5% but with restrictions: for example, a GM card that provides 5% cash back on all purchases up to a limit of $500 per year and the cash can only be used to purchase a GM car, or a card that pays 5% cash back on all purchases beyond a certain monthly amount and only on selected merchant types. Estimating a rewards rate for these more complex programs is challenging, especially since we do not have the exact rewards programs terms. Under the assumption that more complex programs are likely a better deal than a plain 1% cash back program (perhaps because these card users manipulate their spending to benefit from the program), we set a rewards rate of 1.5% for these samples. Again, this estimate is *ad hoc* and we hope conservative.

From these assumptions, we estimate the rewards rate (using OLS) in order to clarify which demographic groups receive rewards. A linear regression based on our full range of variables does not clearly show the effect of individual variables, especially since there are likely collinearities between some of the variables. Instead, we provide results of individual regressions in order to give an idea of the correlations. As explained above, we use three values for the sample of individuals who claimed to receive rewards but did not specify them, and so we provide three analyses for each unknown rewards number. Looking at rewards rate based on income, we find the following:

Income by tract (sample size)	Estimated rewards rate		
	Unknown=0%	Unknown=0.5%	Unknown=1%
TOP 10%, > $84K (101=13%)	0.603%	0.697%	0.791%
10-25%, $66K-$84K (100=12%)	0.435%	0.510%	0.585%
25-50%, $51K-$66K (201=25%)	0.294%**	0.391%**	0.488%*
50-75%, $41K-$51K (201=25%)	0.247%**	0.339%**	0.431%**
75%-100%, < $41K (200=25%)	0.220%	0.298%	0.375%

* Not significant at 99%, ** Not significant at 95%

The estimates of rewards rate are the sum of the constant and the dummy variable coefficients. The bottom quartile dummy variable was left out of the regression, so rewards rate estimated as not significant are likely the value for shown for last quartile (for instance 0.375% for the Unknown=1% result). The standard deviations were in the range of 0.04-0.07% for all results. Generally speaking, the top 10% receive a rewards rate about 0.4% higher than the bottom three quartiles. We perform the same analysis for self-reported income.

Income (self-reported)	Estimated rewards rate		
	Unknown=0%	Unknown=0.5%	Unknown=1%
NO RESPONSE (136=17%)	0.260%	0.377%	0.495%
LESS THAN $25,000 (162=20%)	0.100%	0.149%	0.199%
$25,000-$49,999 (177=22%)	0.314%**	0.356%**	0.399%**
$50,000-$74,999 (130=16%)	0.374%**	0.520%*	0.666%*
$75,000-$99,999 (75=9%)	0.432%*	0.539%*	0.645%**
$100,000-$124,999 (51=6%)	0.531%	0.629%	0.727%*
$125,000-$149,999 (26=3%)	0.323%**	0.419%**	0.515%**
$150,000-$174,999 (12=1%)	0.758%*	0.800%*	0.842%**
$175,000-$199,999 (8=1%)	0.725%*	0.850%	0.975%
$200,000 OR MORE (26=3%)	0.715%	0.831%	0.946%

* Not significant at 99%, ** Not significant at 95%

Again, the results are the sum of the constant and the dummy variable coefficients. The dummy variable for "NO RESPONSE" was left out of the regression and the estimate for it

represents the constant coefficient only. Standard deviations are in the range 0.04-0.10% for the variables except for the incomes $150K-$200K as these had few responses and so the standard deviations are about 0.2%.

Education has an impact on rewards rate. College graduates got about a 0.2% higher rate than high school graduates, and graduate school graduates got 0.1-0.15% more than college graduates.

Education (sample size)	Estimated rewards rate		
	Unknown=0%	Unknown=0.5%	Unknown=1%
NO RESPONSE (20=2%)	0.145%**	0.245%	0.345%
GRADE SCHOOL (13=2%)	0.000%**	0.077%**	0.154%**
SOME HIGH SCHOOL (48=6%)	0.123%**	0.154%**	0.185%**
HIGH SCHOOL GRADUATE (231=29%)	0.210%**	0.277%**	0.345%**
SOME COLLEGE (161=20%)	0.270%**	0.388%**	0.506%**
COLLEGE GRADUATE (193=24%)	0.441%	0.524%	0.607%*
GRADUATE SCHOOL (116=14%)	0.527%	0.647%	0.768%*
TECHNICAL SCHOOL (21=3%)	0.481%*	0.552%*	0.624%**

* Not significant at 99%, ** Not significant at 95%

Results are the sum of the constant and the dummy variable coefficients. The dummy variable for "NO RESPONSE" was left out of the regression. Standard deviations are generally in the range of 0.07-0.11% with the exception of TECHNICAL SCHOOL which has about 0.15%. Since there is a known correlation between income and education, we regress rewards rate on both and find that the increased rewards rate effect due to education appears robust and approximately the same (though a bit smaller).

Race had some effect on rewards rate. Other than WHITE and BLACK, the samples for other race identifiers were rather small and we omit those results. In general, it may be that whites get about a 0.23% higher rewards rate than blacks. From our data, it is unclear if these differences are statistically significant.

Race (sample size)	Estimated rewards rate		
	Unknown=0%	Unknown=0.5%	Unknown=1%
NO RESPONSE (34=4%)	0.259%	0.274%	0.288%
WHITE, CAUCASIAN (621=77%)	0.426%*	0.428%*	0.429%**
AFRICAN-AMERICAN, BLACK (73=9%)	0.190%**	0.197%**	0.204%**

* Not significant at 99%, ** Not significant at 95%

Results are the sum of the constant and the dummy variable coefficients. The dummy variable for "NO RESPONSE" was left out of the regression. Standard deviations are about 0.08-0.09% for WHITE, BLACK, and NO RESPONSE. Regressing rewards rate on race

and income eliminates most of the racial differences. When regressing on self-declared income, the difference between white and black shrinks slightly and becomes less likely to exist. Regressing on Census tract income yields an approximate 0.2% difference in favor of whites and is actually more likely and may be significant. This difference is not actual evidence of disparate treatment, since we do not have the full set of data on which banks make decisions, such as credit score. Nevertheless, we cannot rule out discrimination.

Even without evidence of racial discrimination, low-income minorities have lower average rewards rates due to the strong correlation between income and rewards. The table below illustrates ethnic distribution within each income stratum (data from U.S. Census). Black and Hispanic households make up a significantly smaller portion of the top 10% by income than their overall fraction of the total population.

Income	Ethnicity (%)		
	White	Black	Hispanic
Top 10%	73.1	4.9	9.4
10-25%	70.1	7.1	13.1
25-50%	67.3	9.6	15.7
50-75%	66.9	11.6	15.8
75-100%	55.2	21.4	18.7

A study with a larger sample size (especially amongst minority groups) would be necessary in order examine the question of racial discrimination separate from income.

Employment status does not appear to be a significant separating factor for rewards rate. However, some trends may be noticed. Employment leads to a higher rewards rate while being disabled and, to a lesser extent, retired leads to lower rewards rates. From our data, it is unclear if these differences are significant, so we omit the table.

Results for some of the other variables include: Marital status has a significant positive effect, about 0.19-0.21% better for married respondents versus all other statuses (with standard deviation of about 0.04%). Having a bank account (about 91% of the sample) has a positive effect of 0.23-0.30% on the rewards rate with a standard deviation of about 0.05%. The age of the respondent and the number of children living at home did not seem to have any significant effect on rewards rate.

Spending and rewards

Banks make the argument that rewards benefit merchants because consumers spend more when they use rewards cards. Although we cannot verify this claim as a causal result, we check if higher rewards rates correlate with increased spending.

Survey respondents were asked how much their household spends per month on gasoline and groceries. They were asked to specify the amounts spent using credit cards, debit card, and cash and checks. If the household received EBT (Electronic Benefit Transfer), they were asked how much was spent collectively using EBT and cash. The table below contains average spending depending by payment method, average spending by payment method when that method was ever used, and average spending by payment method for high rewards rate consumers (i.e. those with rate at or above 0.9%, there are 211 of them).

Average spending	Gasoline	Groceries
Total	$215.05	$422.06
Debit	$61.08	$146.75
Credit	$80.66	$100.56
Cash	$92.22	$184.52
Total (when > 0)	$241.85	$445.96
Debit (when > 0)	$161.39	$324.88
Credit (when > 0)	$187.22	$303.33
Cash (when > 0)	$164.66	$254.22
Total (when rewards ≥ 0.9%)	$225.86	$486.26
Debit (when rewards ≥ 0.9%)	$51.61	$144.22
Credit (when rewards ≥ 0.9%)	$122.25	$198.73
Cash (when rewards ≥ 0.9%)	$62.73	$184.52

Although the table shows that higher rewards households spend more on gasoline and groceries, further analysis shows that this correlation is likely not based on the rewards rate. Regressing total spending on rewards rate, income, age, gender, race, number of children, location, and so on, we find little, if any, correlation between rewards rate and total spending on groceries and gasoline. The estimated coefficient on rewards rate is the expected increase in spending by the household on groceries and gasoline for each additional rewards percent. The table below summarizes.

	Estimated rewards rate coefficient (std. dev)		
Spending category	Unknown=0%	Unknown=0.5%	Unknown=1%
Total: Groceries	12.02 (21.98)**	24.13 (23.12)**	29.91 (21.38)**
Total: Gasoline	-12.64 (18.40)**	3.50 (19.37)**	17.99 (17.91)**
Credit: Groceries	70.92 (14.09)	81.09 (14.75)	72.94 (13.77)

Credit: Gasoline	28.09 (11.23)*	46.01 (11.73)	52.80 (10.84)
Debit: Groceries	-31.53 (15.08)*	-23.95 (15.88)**	-11.19 (14.73)**
Debit: Gasoline	-25.03 (8.24)	-23.21 (8.67)	-16.06 (8.02)*
Cash: Groceries	-36.69 (16.91)*	-41.88 (17.78)*	-36.89 (16.44)*
Cash: Gasoline	-22.67 (12.61)**	-22.20 (13.20)**	-16.93 (12.28)**

* Not significant at 99%, ** Not significant at 95%

From the table, it appears that a higher rewards rate unambiguously increased credit card spending, however, much (if not all) of the increase came at the expense of reduced spending using debit cards and cash.

The omitted variable bias in the regression may be quite severe, and it is therefore very possible that rewards rates do not affect spending at all. Omitted variables which affect spending include: taste, regular versus premium gas and brand names versus store brand groceries; distance to work, suburbs versus city; and local price levels, higher-end grocery stores versus cheaper ones. Since these variables may be correlated with income which in turn is correlated with rewards, it seems likely that spending is insensitive to rewards rate.

Rewards distribution

Assuming that card rewards come only from credit card use, we find the distribution of total rewards dollars by income. Since some debit cards do provide rewards and if the pattern of rewards distribution follows that for credit cards, then our results under-represent the surplus transfers. We estimate total amount of dollars transferred within the U.S. due to rewards on gasoline and groceries as $1.369b, $1.641b, or $1.914b depending on unknown rewards rates (set to 0%, 0.5%, and 1% respectively)[1]. Therefore, rewards card holders gain this money while non-rewards card holders effectively subsidize them. Since we have found that rewards are unequally distributed, we calculate the estimated transfers between income groups.

The table below shows credit card use as a percentage of total spending on gasoline and groceries divided by income group. Higher income groups tend to use credit cards more and so are more likely to get rewards.

Income by tract	Average credit card use (standard deviation)

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[1] To calculate these numbers, we use 115 million as the approximate number of households in the U.S. (based on U.S. Census estimates for 2010).

TOP 10%	35.2% (35.6%)
10-25%	35.5% (37.1%)
25-50%	20.3% (30.8%)
50-75%	17.8% (27.9%)
75%-100%	23.8% (34.9%)
Whole sample	24.3% (33.3%)

The chart below shows the estimated average rewards earned by a household in each income group from credit card purchases on groceries and gasoline (when the unknown rewards are assumed to be 0.5%).

Annual rewards (unknown=0.5%)
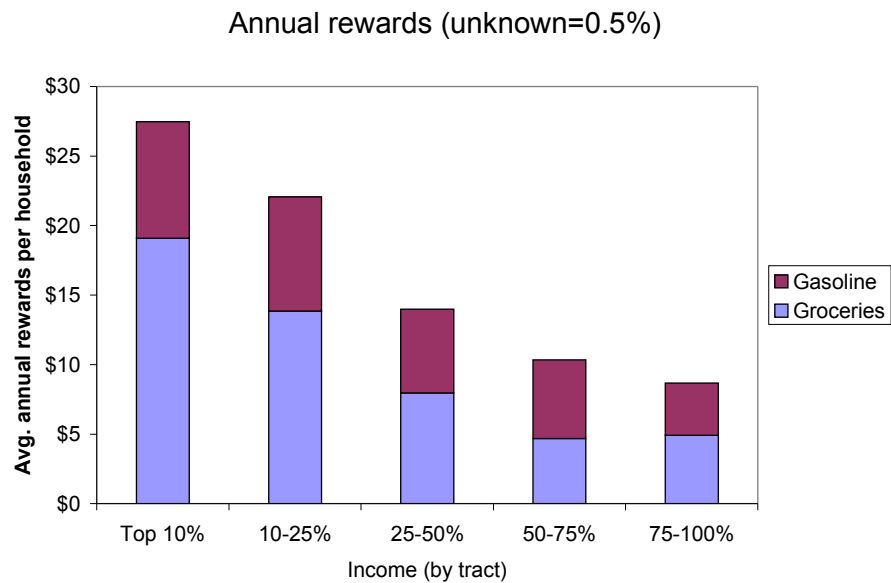
We show one chart based on Census tract divisions and another (the chart below) based on self-reported income. There is a clear and unsurprising trend of increased rewards based on income.

Annual rewards (unknown=0.5%)
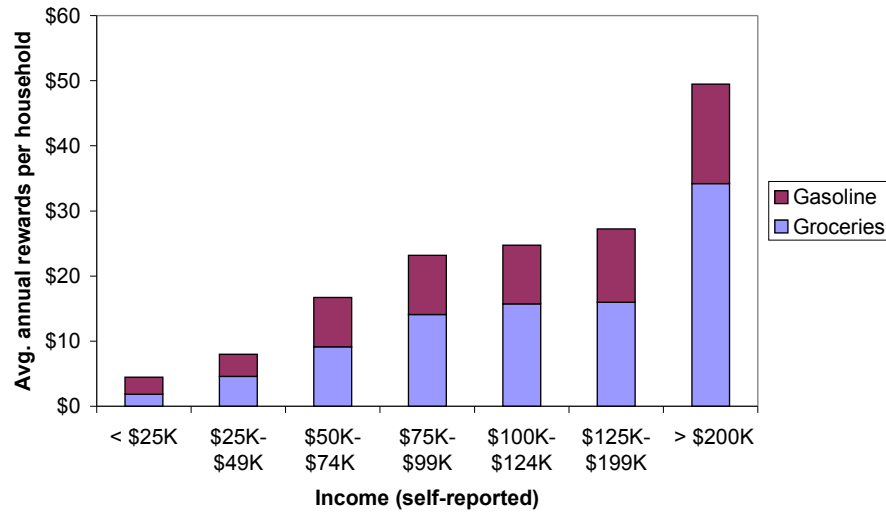
Because different income groups have different implicit costs for each dollar spent on gasoline and groceries (due to the varying discounts from rewards), the existence of rewards creates transfers of wealth between income groups. We estimate transfers by the following equations.

Group Rewards = Group Avg. Rewards x **Group % size** x **115 million**

Equal Rewards = (Group Spending / Total Spending) x **Total Rewards**

Transfer to Group = Group Rewards – Equal Rewards

The table below summarizes the results.

Income group	Average $ spent (std dev)	Rewards ($m)	Implied discount	Transfer ($m)
Top 10%	8,212.87 (5,967.25)	316	0.310%	139
10-25%	8,724.60 (7,377.56)	380	0.271%	99
25-50%	7,695.94 (5,433.34)	402	0.156%	-11
50-75%	7,593.25 (6,949.88)	297	0.121%	-111
75-100%	6,820.26 (5,052.50)	250	0.133%	-117
All	7,645.26 (6,103.83)	1,645	0.175%	-1*

* Transfers do not sum to zero due to rounding.

The top 25% of the population by income apparently receives about $238 million from the remainder of the population even after adjusting for higher consumption by the higher income groups. Furthermore, by the analysis above, these consumption subsidies to do not appear to result in significantly higher spending on these categories.

Because our survey asked only about gasoline and groceries, we cannot estimate total household rewards. Nevertheless, we roughly extrapolate by scaling to total household

spending. Using consumer expenditure data from the Bureau of Labor Statistics survey for 2008[2], we estimate total spending which is payable by payment cards and not subject to surcharges (for instance, apparel but not housing). The included categories list not exhaustive and possibly conservative—for example, we exclude utilities expenditures, even though some such as cable television allow payment by credit card. The table below shows selected categories, with the italicized categories corresponding to gasoline and groceries, and estimates the scaling factor.

Average annual expenditures	Income by quintile				
	Lowest 20%	Next 20%	Next 20%	Next 20%	Highest 20%
Total (all categories)	$22,304	31,751	42,659	58,632	97,003
Food at home	$2,369	2,929	3,436	4,340	5,645
Gasoline and motor oil	$1,243	2,019	2,704	3,418	4,186
Food	$3,473	4,560	5,602	7,589	10,982
Apparel and services	$962	1,151	1,361	2,037	3,490
Entertainment	$1,082	1,716	2,422	3,276	5,673
Others	$3,273	3,962	5,162	7,002	12,121
Total (card categories)	$10,033	13,408	17,251	23,322	36,452
Scaling factor from groceries and gas	2.78	2.71	2.81	3.01	3.71

From this approximation, we see that multiplying our results for groceries and gasoline by a factor of 3 gives a rough idea of the total transfers due to rewards. Quick multiplication from the transfer numbers above implies the bottom 25% by income pay $351m in subsidies while the top 25% receive $714m (as very rough estimates).

Annual fees and other consumer costs

The rewards paid by credit cards are offset partly by any annual fees collected. We did not ask about credit card fees separately from debit card fees, so the actual fees paid to credit cards are likely less. Furthermore, annual fees do not only offset rewards but also pay for other card amenities. Annual fees for all payment cards held by credit card holders averaged $20.52 in our sample with 77% reporting zero annual fees and a small number of outliers reporting fees in excess of $250. Although high annual fee cards exist, we exclude the high fee samples from our analysis because of the small sample size (6 observations) and the large impact on the mean. This exclusion lowers the average fee to $15.28.

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[2] Available at ftp://ftp.bls.gov/pub/special.requests/ce/standard/2008/quintile.txt.

High-rewards households with credit cards (those with a rewards rate greater than or equal to 0.9%) paid on average $19.11 (when unknown rewards have a 1% rewards rate) and $21.26 (when unknown rewards are set to 0%). Restricting the sample to credit cardholders with positive annual fees below $250, a linear regression of annual fees on rewards rate finds not significant coefficients 6.05 with standard deviation 7.19 (for unknown rewards at 0%), 6.90 with standard deviation 7.78 (for unknown rewards at 0.5%), and 6.52 with standard deviation 7.67 (for unknown rewards at 1%). From these results, it seems that annual fees not greatly correlated with rewards rate, if at all.

Looking at correlations between annual fees and rewards by regressing annual fees on rewards rate, income, and other variables, we find the coefficient on rewards rate to be not significant; it is 6.94 with standard deviation 10.45 (for unknown rewards at 0%), 4.31 with standard deviation 11.92 (for unknown rewards at 0.5%), and -0.46 with standard deviation 12.37 (for unknown rewards at 1%). Furthermore, because of omitted variables, it is probable that the actual coefficient is lower. To summarize, annual fees likely offset about $0 to $7 of total household annual rewards for a household with a 1% rewards rate.

We repeat the surplus analysis above with a reduction of rewards of $1.50 per 1% rewards rate for households with credit cards and an annual fee. The rewards reduction is based on the approximately $4.50 increased annual fee (for unknown rewards at 0.5%) divided by the factor of 3 (from the estimate above scaling gasoline and groceries spending to overall consumption).

Income group	Rewards ($m)	Implied discount	Transfer ($m)
Top 10%	285	0.302%	118
10-25%	352	0.234%	86
25-50%	409	0.185%	18
50-75%	258	0.118%	-127
75-100%	250	0.128%	-96
All	1,556	0.177%	1*

* Transfers do not sum to zero due to rounding.

The transfer amounts are somewhat less high to the top 25% ($204m vs. $239m) and the second quartile is slightly subsidized instead of subsidizing. However, the pattern is very similar to the case without annual fee adjustments.

Card issuing financial institutions may have found a correlation between other fees and interest payments and rewards card use. Increased other income from rewards card users would serve to reduce the net transfer effect because card users effectively pay more to use the rewards card (much as with annual fees). However, we did not have enough data to analyze this potential correlation. The survey asked about how much the household pays in monthly fees of all types for all payment cards. For credit cards alone these fees include: annual fees, late fees, over-the-limit fees, balance transfer fees, inactivity fees, cash advance fees, international transaction fees, telephone payment fees, and others. From the survey answers, twenty-eight reported card fees in excess of $100 and ten reported fees in excess of $400 in one month It may be that some card holders have little choice but to pay very high average monthly card fees; it is also true that some respondents may have provided what they paid in credit card fees in just the last month (or other single month) rather than an average. A simple linear regression of other fees over rewards rate over the whole sample yields a negative coefficient on rewards rate, meaning higher rewards are correlated with reduced fees. Dropping the samples with other fees greater than $100, the coefficient is effectively zero. Therefore, we ignore fees as an adjustment of rewards.

It may also be the case that banks recover greater costs from rewards card holders if they charge a higher interest rate and rewards card holders carry balances on their cards. According indexcreditcards.com for September 30, 2009, the average consumer rate was 14.99%, the average credit card rate, non-reward consumer cards was 14.27%, and the average reward credit card rate was 15.87%. Since the rewards interest rate is higher, we check if rewards card holders carry balances in order to help determine if interest charges are higher for rewards card holders. The table below describes the distribution of credit card holder balance carriers by income and rewards rates. We divide rewards rates into a high category (rewards rate 0.9% and higher) and low category (below 0.9%).

Income by tract	% carry balance		
	Unknown=0%	Unknown=1%	Ignoring rewards
TOP 10%	High: 25.0% Low: 23.3%	High: 23.9% Low: 25.0%	24.2%
10-25%	High: 27.0% Low: 42.6%	High: 32.7% Low: 40.6%	35.7%
25-50%	High: 30.0% Low: 45.4%	High: 35.7% Low: 46.0%	40.1%
50-75%	High: 33.3%	High: 32.5%	35.3%

|	Low: 36.1%	Low: 38.4%	
75%-100%	High: 20.0%	High: 30.6%	32.8%
	Low: 37.5%	Low: 34.8%	

A linear regression predicting rewards rate from a binary variable indicating whether a household carries a credit card balance finds the coefficient to be -0.100 (std. dev. 0.050 and significant at 95% confidence) for unknown rewards set at 1% and -0.133 (std. dev 0.049 and significant at 99% confidence) for unknown rewards set at 0%. So, carrying a balance is correlated with a lower rewards rate. The distribution above shows that the top 10% of households by income generally carry balances at a lower rate than the rest of the population. Therefore, our results indicate that high rewards cardholders, and so higher income households, tend not to carry card balances. Although we do not have the sizes of carried balances or the interest rates for the households in our sample, it seems that rewards cardholders may pay less in interest fees than non-rewards cardholders. We do not know if the lower incidence of balance carriers compensates for the higher interest rate on rewards card holders. Although more research is required for a definitive answer, there seems good reason to believe that our transfers numbers are not diminished by interest charges and may, in fact, be greater.

Consumers pay interchange fees

Analysis above showed that a portion of consumers pays more for identical goods than other consumers. The amount of this price differential must accrue to some other party or parties in the market: the merchants, the card scheme, or the portion of consumers who receive rewards. We try to see if merchants set prices so high, in response to increased rewards (and card fees), that they earn extra profit from the lower fee cards. For instance, suppose a merchant sets prices to compensate himself for the highest card fee (say 3%). Every sale which has lower card fees generates excess profit for the merchant.

We look at quarterly aggregated operating statements for a sample of gasoline retailers from 2000Q4 to 2009Q3 (partial). The number of stores in the sample varies by quarter and ranges from 695 to 6140; firms own more than one store and the number of firms in the sample ranges from 28 to 124. The time period covers a variety of different economic conditions as fuel sales prices were volatile, ranging from $1.14 to $.3.77 per gallon. Credit

card costs per gallon also climbed relatively steadily through this period. The graph below shows card costs divided by sales, the sales price of fuel per gallon, and operating profit divided by sales, all normalized to 2000Q4=1.
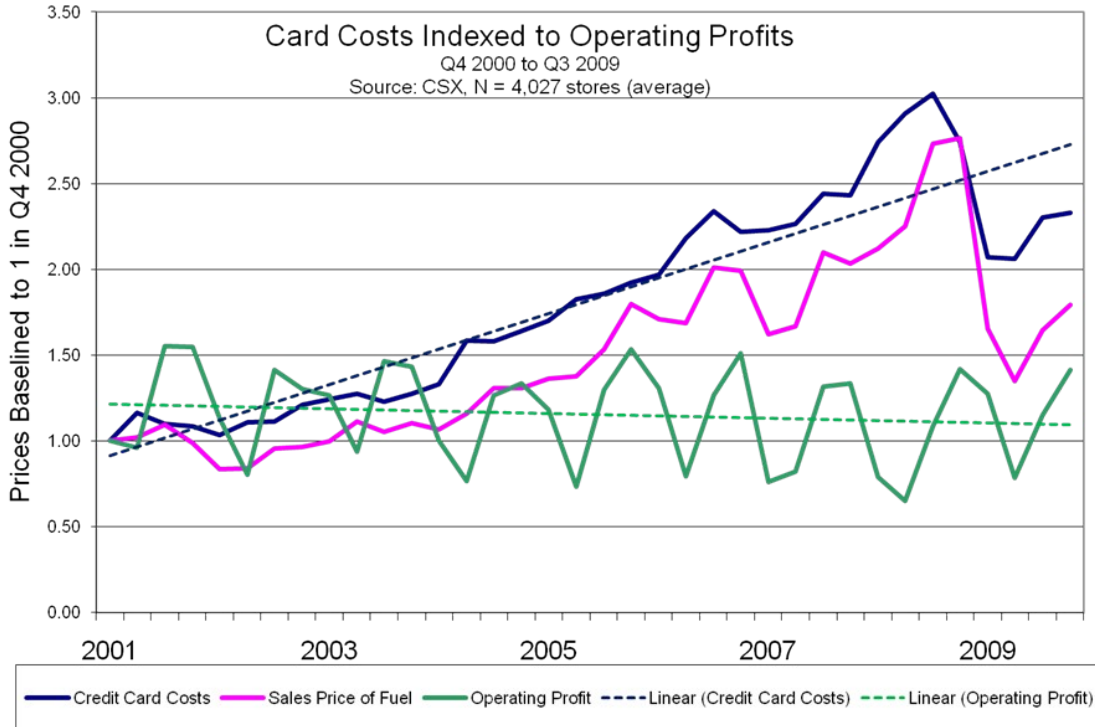
Looking for correlations between profit and credit card fees finds the correlation to be effectively zero (after conditioning on fuel prices). The table below shows various correlation checks.

Correlation: Card Costs to Operating Profit, conditioned on Fuel Cost ($)	0.093659 with p=0.5925
Correlation: Card Costs to Operating Profit, conditioned on Fuel Sales ($)	0.001430 with p=0.9935
Linear regression: Operating Profit on Card Costs and Fuel Sales ($)	Coefficient on Card Cost: 0.012438 (std. dev. 1.473235) with p=0.9933

Though the results show effectively a zero correlation, one may actually expect a slightly positive correlation to compensate for inflation—merchants should be increasing dollar margins to maintain the same real return. In fact, it may be that merchants' real margins are declining slightly in correlation with increased card costs.

One may also consider whether merchants funnel any excess funds into investments, thereby keeping profit nearly constant. We check this hypothesis by regressing various expenditures on card costs along with total sales, fuel sales, and gross occupancy cost. Adding sales and fuel sales helps to remove the dependence between increased sales and card charges. Gross occupancy cost proxies for an inflation measure. The table below reports the results.

Capital expense	Coefficient on Card Costs
Advertising	-0.0401 (std. dev. 0.0434) p=0.3630
Business insurance	-0.0208 (std. dev. 0.0647) p=0.7514
Dues and donations	0.0159 (std. dev. 0.0104) p=0.1378
Equipment rent	-0.100 (std. dev 0.0558) p=0.0823
Repairs and maintenance*	0.0857 (std. dev 0.0654) p=0.2001
Wages and benefits	-0.0760 (std. dev 0.363) p=0.8354

* These regression results include depreciation as an independent variable.

From these results, it seems there is effectively a zero correlation between fees and various expenditures. None of the above coefficients are statistically significant at 95% and therefore it is likely merchants do not change these expenses in response to changes in card charges.

We, therefore, claim that any transfers due to the differential pricing of card fees and rewards do not accrue to gasoline retailers and must be apportioned between the bank/card scheme and consumers (based on rewards rates). We hypothesize that competitive industries (of which gas retail is one) likely do not receive any transfers from differential pricing. The direct implication is that, in competitive industries, interchange fees are passed through to the consumer resulting in higher nominal prices, so when interchange fees are lower, prices are lower.

Policy discussion

Various policy recommendations have been proposed to ameliorate the market distortion detailed in this study: (1) lowering allowed interchange fees, (2) allowing merchants to impose price discounting depending on payment method, (3) disallowing contracts that force merchants to accept all cards, (4) setting interchange fees uniformly regardless of rewards, and (5) setting a baseline fee and allowing merchants to voluntarily participate or

exempt themselves from any card rewards programs. All of these options merit further study; our goal is to provide an overview of further directions to consider.

Lowering interchange fees through regulatory action or through voluntary reductions, as in the case of Australia, necessarily reduces the price differential and hence the transfers described in this study. Pricing and discounting by payment method at the point of sale eliminates the price differential to the extent that the ability to discount is utilized. Merchant choice in allowed payment methods may have similar effect as well (see Semararo (2009) and Economides (2008) for further discussion).

If the goal of cards rewards is to encourage consumption, then it may be efficient to allow merchants to discount to specific consumers rather than implementing a broad discount to all rewards card holders. Specifically, consider consumer A, who has a rewards card, and consumer B who does not. Both consumers buy $120 of gasoline every month and demand for both is somewhat inelastic in that lower prices do not spur additional gasoline consumption. It seems strange that a gasoline retailer would want to provide lower prices to A when it does not lead to higher profit (or even higher revenue). Suppose, on the other hand, that A has elastic demand for hotel stays whereas B does not. Then, a hotel operator may benefit from A's rewards card since A buys more hotel stays than he would have without card rewards. To summarize, different goods have different elasticities of demand and a discounting scheme that provides a single discount rate is likely to be inefficient and create transfers within the economy.

Two fundamentally similar policy approaches address this question of rewards. One option is to ban the price differential by requiring interchange fees to be the same for rewards and non rewards cards. This solution would remove the cross-subsidization inefficiency found in this study. Merchants wishing to engage in targeted discounting would do so through existing methods (such as coupons, merchant cards, and so on).

The other very similar policy solution is to have rewards programs or not. A single fee rate is set for all rewards and non-rewards cards as above. However, if the merchant allows

rewards, then the merchant agrees to higher card fees, and if the merchant does not allow rewards, then the merchant is charged a lower fee. Consumers and merchants would be made aware of the rewards regime prior to purchase.

A comparable scheme already exists in some rewards programs where consumers earn higher credit card rewards for purchases at partner merchants or merchant categories (*e.g.* hotels, groceries, and so on). In such programs, issuing banks provide an outsourced, specialized service by implementing a customer discount program for the merchant. Allowing merchants to decide on their own rewards programs rather than having one forced upon them should unambiguously lead to higher social welfare with less distortion of the kind found in this study. While the suggested policy does not eliminate or reduce all types of market inefficiencies in the payment card market, this policy may reduce the harm of cross-subsidization created by the current fee regime.

Conclusion

Consumers use payment cards for a large percentage of retail purchases. The payment card market is two-sided in that the payment card provider can charge fees to both merchant and consumer. Card issuers have used rewards programs offering cash and goods to certain consumers who use their cards. The cost of these rewards programs is charged primarily to the merchant by means of fees levied on card transactions. We estimate that rewards on gasoline and groceries in the U.S. are in the range $1.4b to $1.9b. While any unnecessary transfers are inefficient, the unequal distribution of these rewards creates a transfer between various consumer groups and seems to provide no other benefit.

Using survey data on household spending on groceries and gasoline and payment card use, we estimate the dollar rewards received by each household in our sample. We calculate the implicit discount received by the household. We find that spending on gasoline and groceries is not sensitive to the rewards rate, so that the different implicit discounts appear to be nothing more than a transfer mechanism. Because of the distribution of rewards within the population, these transfers move money from lower income groups to higher

income groups. Aggregating across income groups, we determine the transfers between groups due to payment card use. We estimate the adjusted transfer received by the top 10% of the population of income to be about $118m due to spending on groceries and gasoline. Our estimates are lower than the actual welfare transfers because the above amount does not account for other benefits consumers gain through the use of credit cards as a payment method over other methods such as cash (benefits such as increased liquidity, security, speed of transaction, and so on). Analysis of gasoline merchants finds that profits do not increase with higher card fees, implying that merchants do not gain surplus from this transfer mechanism.

The current regime of untargeted discounts from rewards cards creates a market distortion and inefficiency. Furthermore, the distribution of rewards within the population increases social inequality by transferring wealth from lower income consumers to higher income consumers. Untargeted discounting through rewards programs does not account for different elasticities for different goods and necessarily creates transfers within the economy. Rewards in the real economy likely generate even higher transfers.

We discuss various policy responses to address this problem: (1) lowering allowed interchange fees, (2) allowing merchants to impose price discounting depending on payment method, (3) disallowing contracts that force merchants to accept all cards, (4) setting interchange fees uniformly regardless of rewards, and (5) setting a baseline fee and allowing merchants to voluntarily participate or exempt themselves from any card rewards programs. All of these options merit further study.

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