

Credit Card Debt and Consumption: Evidence from Household-Level Data

By

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Abstract

This research investigates the relationship between credit card debt and consumption using household level data. This is a departure from previous studies which have used aggregate measures of consumption and general debt such as the Debt Service Ratio or total revolving credit. We use a detailed monthly survey of credit card use to impute credit card debt to respondents from the *Consumer Expenditure Survey* sample. In contrast to some earlier studies using aggregate data, we find a negative relationship between debt and consumption growth. Our work shows that a one-thousand dollar increase in credit card debt results in a decrease in quarterly consumption growth of almost two percent. Investigations are also made into effects of debt within different age categories and into the impact of expected income growth on the debt-consumption relationship.

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1. Introduction

Credit cards have become a major instrument for carrying out and financing purchases in the U.S., with the average credit card debt for balance-carrying households reported to be more than \$9,000¹. Furthermore, credit card debt has risen faster than household disposable income, raising concern among policy-makers. Increased borrowing on credit cards to finance consumption is usually seen as a stimulating factor for the economy. However, there is concern that high levels of debt may curtail spending in the future and hence ultimately slow economic growth. There have been conflicting findings on this issue from studies based on aggregate data. Here we use a new approach to shed further light on the debt-consumption relationship.

We depart from previous research in this area in the following two ways. First we use individual, monthly household-level data drawn from a new survey of credit card use in conjunction with the Bureau of Labor Statistics *Consumer Expenditure Survey*, a monthly survey focused on household-level spending. It has been suggested in the literature that aggregate measures may obscure the impact of debt burdens and financial constraints (McCarthy, 1997). It may thus be the case that the debt-consumption relationship can best be determined from data on individual households over time.

Secondly, our study focuses specifically on the effect of credit card debt rather than overall household debt. According to the 2004 *The Survey of Consumer Finances*, approximately 75 percent of all households own at least one credit card, and 58% of those holding a credit card carry a balance. The Federal Reserve Board puts current U.S. revolving debt at more than \$800 billion – mostly credit card balances. This represents a 600 percent

¹ The average credit card balance among revolvers was \$5,100 according to the 2004 *Survey of Consumer Finances* and \$9,205 according to Bankrate.com.

increase in such debt in the last two decades. Furthermore, the American Banker's Association reports that the use of credit cards for small everyday purchases is growing, with U.S. consumers currently making more than 350 billion transactions of less than \$5, representing \$1.32 trillion. Since credit cards have become a major vehicle for carrying out and financing consumption, it is important to specifically gauge the impact of this financial instrument.

To the best of our knowledge no single data set has the monthly information on both household consumption and credit card debt necessary to address the issues of concern here. Monthly information on spending habits of individual households is available from the *Consumer Expenditure Survey (CEX)*. The only publicly available data set with detailed information on credit card debt on a monthly basis comes from *Ohio Economic Survey (OES)*. Since both of these surveys were conducted on samples whose characteristics are representative of the U.S. population, we use an imputation procedure to match their information.²

Our results show that credit card debt has a significant and *negative* impact on total household consumption growth. A one-thousand dollar increase in credit card debt leads to a decrease of almost two percent in total household consumption growth. When consumption is separated into durable and non-durable categories, the effect is still negative but not as significant. These findings suggest a need for greater attention to credit card debt levels and their general economic impact.

2. Background and Previous Research

Research on credit card market in economics literature has been relatively new. One of the earliest issues addressed by researchers has been the sticky interest rates in this market and effects of search on interest rates (See Ausubel, 1991; Mester, 1994; Stavins, 1996; Park 1997;

² See Dunn, *et. al* (2006) for sample characteristics. The *Survey of Consumer Finances (SCF)* has been widely used in this literature, but the *SCF* appears only once in three years and is thus not suitable for this research.

Brito and Hartley, 1995; Calem and Mester, 1995; Crook, 2002; Kim, Dunn, and Mumy, 2005; Kerr and Dunn, 2007). Researchers have also estimated interest rate elasticity of credit card debt (See Gross and Souleles, 2002b; Shen and Giles, 2006). Another strain of the literature has looked at the effect of credit card debt on default and bankruptcy (See Laderman, 1996; Ausubel, 1997; Dunn and Kim, 1999; Domowitz and Sartain, 1999; Stavins, 2000; See Gross and Souleles, 2002a; Fay, Hurst, and White, 2002; Lehnert and Maki 2002; Agarwal, Lui, and Mielnicki, 2003.) In this paper we focus on the effects of credit card debt on future consumption patterns of households.

There is some existing empirical evidence that suggests a link between general household debt and household consumption, even though basic theoretical models (e.g., the life-cycle model and permanent income hypothesis) predict that contemporaneous variables such as consumer credit/debt should not play a role in consumption growth. Most previous studies have used data series from the Federal Reserve Board for their measures of aggregate debt levels – usually the Debt Service Ratio (DSR) or total revolving credit.³ There has been inconsistency in these findings regarding the sign of the impact of debt on consumption. Carroll and Dunn (1997) and McCarthy (1997) have studied the relationship between household debt growth and durable consumption and also find a positive and significant relationship between these variables. Ludvigson (1999) finds that changes in total installment credit and revolving credit are significantly related to non-durable and service consumption growth. Maki (2000) finds that changes in consumer credit and delinquencies, but not the DSR, are positively related to consumption growth. Using a new index of credit card debt, Dunn *et. al.* (2006) are able to show

³ The Federal Reserve has recently undertaken revisions to the DSR to make the process used in its calculation more in line with recent changes in financial markets and consumer behavior, and a Financial Obligations Ratio has been developed. (Dynan *et. al.* 2003, Johnson, 2005).

that 10-14 percent of aggregate consumer durable spending can be explained by this type of debt. The direction of the impact in this work is positive. On the other hand, Murphy (2000), using different control variables, finds a negative relationship between lagged values of the DSR and spending on durable goods and services. In addition, Olney (1999) finds a negative relationship between consumption and debt during the period of the 1930s in the U.S. Finally, Zhang, Bessler, Leatham (2006) find no significant relationship between the U.S. household debt service ratio and GDP for the periods of 1980-2003.

Clearly, the effect of debt repayment with interest on consumption in future periods depends on complicated assumptions about future income growth and consumption smoothing. The existence of non-secured lines of credit with flexible repayment, i.e., credit cards, adds another layer of complexity to the debt-consumption picture. Most measures of debt used thus far are highly aggregate and may not be capturing subtle aspects of the debt burden of individual households. The present paper investigates the impact of the growth of consumer credit card debt on the growth of consumption using individual *household* data for both consumption and debt. It focuses specifically on credit card debt, as credit cards have become a major method for financing consumption in the U.S. and are more widely utilized than other debt instruments.

3. Data

To the best of our knowledge, no single data set has detailed information on both households' spending habits and credit card use from the same respondents. Therefore we will match data from two surveys where the characteristics of respondents are both very close to the U.S. national averages – the *Consumer Expenditure Survey (CEX)*, which has information on spending habits of U.S. households, and the *Ohio Economic Survey (OES)*, which has detailed information on credit card usage of households. Here our credit card debt is estimated from

OES sample, and the estimated coefficients are then used to impute the debt of the households with the same characteristics in the *CEX* sample. The matching can be done finely since the characteristics of both samples are very close to U.S. national averages.⁴ (See Appendix A for details on these surveys.)

4. Econometric Methodology

We estimate the reduced form equation by including lagged values of debt as explanatory variables for consumption growth. The equation to be estimated is as follows:

$$d \ln C_{i,t+1} = b_0' time_t + b_1' W_{i,t+1} + b_2' D_{i,t} + \eta_{i,t+1} \quad (1)$$

where D is the lagged debt, $time$ includes a full set of month dummies⁵. W includes the age of the household head and its square, the change in the number of adults, and the change in the number of children, as is standard in estimating this type of equation.⁶ We will impute the credit card debt of the households in the *CEX* sample using coefficients from an estimation of debt of the *OES* sample members with similar characteristics. We then estimate eq. (1) using the imputed debt variable. The imputation process is explained in the next section.

4.1 The Imputation of Credit Card Debt

We estimate credit card borrowing for those households with at least one credit card in the *OES* sample with a Tobit model, since credit card debt is left-censored at zero. The Tobit model, which is estimated by maximum likelihood, has the following form:

$$y_i^* = \beta' x_i + \varepsilon_i, \varepsilon_i \sim N[0, \sigma^2] \quad (2)$$

⁴ A detailed comparison is available from the authors upon request.

⁵ The omitted month is April 2002.

⁶ It is conventional to use the variables in W in order to control for changes in household preferences. See Zeldes (1989), Dynan (1993), Lusardi (1996), and Souleles (2004).

where if $y_i^* \leq 0$ then $y_i=0$, and otherwise $y_i=y_i^*$. We thus obtain $[\hat{\beta}, \hat{\sigma}]$. The coefficients and standard errors from the estimation of eq. (2) are given in Table 1. The results there conform to the results of previous work in the literature.

Table 1: Tobit Estimation of the Credit Card Debt of Those Holding at Least One Card in OES Sample

Variable	Definition	Coefficient Standard Error
<i>Number Children</i>	Number of children age<18 in the household	299.98* (48.31)
<i>Number Adults</i>	Number of adults in the household	195.4* (74.4)
<i>Gender</i>	Dummy =1 if Male =0 otherwise	-541.46* (105.55)
<i>Log Income</i>	Log of total household income	448.117* (84.69)
<i>Homeownership</i>	Dummy =1 if owns house =0 otherwise	-412.29* (147.25)
<i>Employed</i>	Dummy =1 if respondent employed full- or part-time =0 otherwise	1284.95* (127.57)
<i>White</i>	Dummy =1 if respondent is white =0 otherwise	-724.498* (173.78)
<i>High School</i>	Dummy =1 if highest grade completed is twelve =0 otherwise	-288.88 (250.62)
<i>Some College</i>	Dummy=1 if highest grade completed is between 12 and 16 =0 otherwise	-85.16 (254.15)
<i>College Degree or Higher</i>	Dummy =1 if highest grade completed ≥ 16 (college degree); =0 otherwise	-1042.875* (260.26)
<i>Age</i>	Age of the respondent	-40.55* (4.26)
<i>N</i>	Number of Observations	17,230

* Significant at 1% level. The time dummies (12 month and 5 year dummies) are not shown.

We will use these estimates to impute credit card debt for cardholders in the *CEX* sample. However, since we cannot identify card-ownership from the *CEX* survey, we will determine which sample members have credit cards with the following steps.

Step 1. We first estimate the probability of having a credit card in the *OES* sample with a Probit model by using the same explanatory variables as in Table 1. The variable definitions are the same as the ones used in Table 1⁷.

Step 2. Taking the estimated coefficients from Step 1, we *impute* the probability of having a credit card for the *CEX* sample members with the same socioeconomic characteristics, using time dummies to align the periods of the observations.⁸

Step 3. If the imputed probability of credit card ownership is greater than 0.5, we assign the value of one (havecard=1) to that respondent to indicate that he/she has a credit card; otherwise (havecard=0)⁹. The percentage of credit card holders in the *OES* sample is 80%, and the imputed percentage in the *CEX* is close at 78%.

After obtaining $[\hat{\beta}, \hat{\sigma}]$ from eq. (2) and identifying card ownership in the above three steps, we can impute the credit card debt for those holding credit cards in the *CEX* sample as follows:

$$\text{Predicted Debt of Cardholders in } CEX = E[y | x] = \Phi\left(\frac{\hat{\beta}'x}{\hat{\sigma}}\right)\left[\hat{\beta}'x + \hat{\sigma} \frac{\phi(\hat{\beta}'x / \hat{\sigma})}{\Phi(\hat{\beta}'x / \hat{\sigma})}\right] \quad (3)$$

Where ϕ, Φ are the standard normal probability distribution function and cumulative distribution function respectively.

It is important to be sure that the variables in the vector x are available in both samples. The variables in this vector are the ones shown in Table 1. We also include time dummies in the x_i vector in order to control for seasonal trends in credit card borrowing. To reduce computational complexity, we will have twelve month dummies and five dummies for year. In order to get the timing correct, the imputed debt corresponds to the first month of the interview

⁷ The results in this step conform to the previous literature. The results are available from the authors upon request.

⁸ The *CEX* has multiple observations on the same households, but for Step 2 we utilize only the first observation.

⁹ In preliminary investigations, the value 0.5 gave us the highest rate of correctly identifying the two groups.

quarter. For example, if we are trying to estimate the consumption growth between the first and second quarters of 1998, i.e. January 1998–March 1998 and April 1998–June 1998, then the lagged debt variable corresponds to the credit card debt of the household in January 1998. This ensures that the respondent has full information about his/her debt level before making consumption decisions in the next two quarters. Thus this also provides a test of the Permanent Income Hypothesis where current information should have no effect on consumption decisions of the future.

After imputing the credit card debt for the respondents in the *CEX* sample, we estimate the following equation for consumption for the credit cardholders:

$$d \ln C_{i,t+1} = b_0' time_t + b_1' W_{i,t+1} + b_2 \hat{D}_{i,t} + \eta_{i,t+1} \quad (1')$$

where \hat{D} is the imputed debt. We estimate equation (1') for four different measures of spending: durable spending, non-durable spending, total spending, and outlay expenditures. The definitions of these variables in the context of the *CEX* and an explanation of their components are described in Appendix B. The standard errors have been adjusted to take account of the fact that one of the regressors in equation (1') is generated from another sample, which leads to consistent but inefficient estimates.¹⁰ The OLS results of the estimation are presented on Table 2

¹⁰ Details of this adjustment process are available from the authors upon request.

**Table 2. Estimated Coefficients of the Consumption Equation,
Credit Card Holders Only**

	d ln(Total Consumption)	d ln(Outlay)	d ln(Durable)	d ln (Non-durable)
Lagged Debt	-1.743E-05* (4.0399E-06)	-1.223E-05* (4.2E-06)	-1.89E-05 (1.159E-05)	-3.65E-06 (2.86E-06)
Age	-0.0001557 (0.0007)	-2.3E-04 (7.56E-04)	7.78E-03* (2.06E-03)	-4.5E-04 (4.97E-04)
Age Square	-2.61E-06 (6.45E-06)	-7.68E-07 (6.98E-06)	-6.34E-05* (1.92E-05)	3.36E-06 (4.57E-06)
Change in number of children	0.031* (0.0128)	-0.00046 (0.0143)	0.008 (0.0357)	0.0315* (0.009)
Change in number of adults	0.104* (0.0115)	0.0956* (0.0128)	0.072* (0.0328)	0.088* (0.0082)
N (#obs)	65,312	35,040	58,051	65,307

The standard errors are shown in parentheses. The coefficients for month dummies are suppressed for sake of brevity.

* Significant at 1% level

5. Results:

The results in Table 3 show that credit card debt significantly and negatively affects both total consumption growth and total outlay growth. Every \$1,000 increase in total credit card debt reduces quarterly total consumption growth by about 1.7 percent and quarterly total outlay growth by about 1.2 percent. The relationship is still negative for durable and non-durable growth separately, although these results are not significant at 10 percent level.¹¹ In general, the coefficients on age and change in family size are consistent with other studies. We have also estimated eq (1') for the entire sample of *CEX* households assuming that everybody has a credit card. The results are qualitatively similar for total and outlay expenditures and also produce a significant negative relationship with non-durable consumption growth.

To gain more insight into our findings, let us consider the fact that credit card borrowing has been found to vary considerably with the age of the consumer (Jiang, 2006).. We have estimated equation (1') for different age categories in the sample. The results are presented in

¹¹ This may be related to the way in which we have designated goods as durable and non-durable since the *CEX* provides no conventions on this.

Table 4 below. We see that lagged debt tends to be significant for consumption in the middle group of age categories but not for the very youngest and oldest age groups.

Table 3. Estimated Coefficients of the Effect of Lagged Credit Card Debt on Consumption Growth by Age Group (Cardholders Only)

	Coefficient	Standard Error	t-value	N
<30	-0.00001732	0.00001246	-1.39	5,905
30-39	-0.00001985	0.00000781	-2.54	13,288
40-49	-0.00001835	0.00000808	-2.27	14,748
50-59	-0.00001575	0.00001014	-1.55	11,370
60-69	-0.00002152	0.00001243	-1.73	8,390
70-79	-0.00001886	0.00001687	-1.12	7,653
80+	-0.00001201	0.00002844	-0.42	3,958

These results are consistent with models of consumption growth using fixed borrowing constraints (Deaton, 1991; Carroll, 1997; Zhang and Wan, 2004). Debt will be a problem for consumption growth only when a consumer is at or near the borrowing limit. In the early stages of the lifecycle, consumers usually have lower credit limits but optimistic expectations for income growth and hence growth in their credit limits (Ludvigson, 1999). Once consumers reach their thirties, credit cardholding increases, debt levels start to build, and they begin to reach the borrowing limit on cards (i.e., “max-out”), as seen in Table 4 below, which demonstrates this from the *OES* data. Since high debt levels and multiple cards are treated negatively in credit scoring models used by banks, these phenomena reduce the likelihood of credit extension. Hence as consumers age, their consumption growth is likely to be negatively affected by their credit card debts. Studies based on aggregate data only capture the behavior of the “average” household, even though the average household may not be typical of those households with credit card debt and/or operating under financial constraints.

Table 4. Mean Credit Characteristics of Credit Card Holders by Age Category

Age	Debt	Number of Cards	Credit Line	% Maxed out at least one card	Household Income
<30	\$1,923	1.59	\$9,485	0.36	\$41,343
30-39	\$2,537	1.78	\$19,673	0.25	\$51,869
40-49	\$2,655	1.89	\$21,548	0.22	\$57,068
50-59	\$2,202	1.92	\$23,784	0.14	\$56,568
60-69	\$1,293	1.8	\$19,065	0.08	\$38,907
70-79	\$690	1.63	\$15,865	0.04	\$26,133
80+	\$258	1.54	\$12,201	0.05	\$21,638
ALL	\$2,044	1.79	\$18,744	0.19	\$47,767

Another factor which influences consumption decisions is expected income growth. Our results are consistent with models relating consumption growth to expected income growth (Campbell & Mankiw, 1990; Deaton, 1991). These models have found that agents who expect their income to grow in the next period tend to increase their current consumption. Using micro-level consumer confidence data, Souleles (2004) shows that more optimistic income expectations lead to less steep consumption profiles. The income expectations of individual consumers have been found to be positively related to credit card borrowing using *OES* data (Ekici, 2006), as well as with household-level data from the U.K. (Brown *et.al.*,2005). In the case that the expectations are not realized, credit card debt becomes problematic. Thus it has been argued that it is actually income expectations rather than debt that drives consumption decisions (Maki 2000). We have tested this notion by adding income expectations to our model of consumption growth.¹² Since expected income growth is not available in the *CEX*, we again employ imputation techniques similar to those used in Section 4 with the *OES* data where this variable is available. The results show that lagged debt is still a significant *negative* predictor of consumption growth even after controlling for income expectations.

¹² We use the same University of Michigan consumer confidence question utilized by Souleles (2004) in a similar estimation method to impute income expectations to the *CEX* sample.

6. Summary and Conclusions

This research has estimated the effect of lagged credit card debt on consumption growth at the level of the U.S. household. Since no single data set contains the appropriate monthly information on both consumption and credit card debt, we have combined two data sets drawn from samples with similar characteristics to estimate this relationship. Our results show that lagged debt is negatively related to total household consumption growth.

With the exception of the work of Olney (1999) and Murphy (2000), most previous studies using aggregate data have found a positive relationship between lagged debt and aggregate consumption growth. Since the impact of debt burdens and financial constraints may not be adequately detected from aggregate measures, the use of household-level data may provide a better test of the true debt-consumption relationship. In addition, earlier studies used aggregate consumption data from consumers economy-wide with debt information only from those consumers who actually held debt. Thus the relationship that emerged from those studies cannot be applied to all consumers. By using household-level data on debt and consumption, we can control for the presence of debt as well as other relevant socioeconomic characteristics that impact the relationship between the two. Finally, our work is unique in that it uses specifically credit card debt, which has become a major financing instrument for household consumption in the last two decades.

We have also explored possible individual factors that may be connected with our finding of a negative debt-consumption relationship and find that the relationship is still negative, although less significant in the older and younger age ranges. We have presented statistics which suggest that this may be due to differences in credit limits and other credit card-related factors for different-aged consumers. We have also controlled for differences in income expectations

and still find that the basic debt-consumption relationship is negative. These findings further emphasize the importance of examining alternative specifications for the debt-consumption link.

It is possible that over a longer period of time, the debt-consumption relationship for households might look different. On the one hand, with growing income and access to alternative forms of credit such as home equity loans, consumers may be able to manage their credit card debt so that it does not negatively impact consumption. On the other hand, the increasing trend of personal bankruptcies suggests that credit card debt may continue to be a problem for household consumption in the long-run. More extensive panel data sets are needed to better assess these long-run possibilities for policy actions.

Appendix A: The Two Surveys

The *CEX* is a national survey of the Bureau of Labor Statistics which collects data on the spending habits of U.S. households. We utilize the Interview Survey component in which respondents are interviewed five times, three months apart. Different households are interviewed starting in different months. Survey participants are asked to record the dollar amounts for goods and services purchased during the 3-month period prior to the interview date, and the resulting data covers about 95 percent of household expenditures.¹³ The final estimation includes about 85,000 observations.¹⁴ The *CEX* survey does not identify credit card ownership except for those with positive debt, and this is only recorded for the first of the second and fifth interview months. Also, the *CEX* does not take account of any debt repayment which may occur in the month. The *OES*, however, records exact credit card debt, including zero debt, on a monthly basis. Its data come from a survey taken each month of at least 500 households for the period January 1997 through April 2002, giving a total sample size for the *OES* is 40,320.

¹³ For more information on the description of the *CEX* survey, see *CEX Anthology* (2003).

¹⁴ Sample selection was done in according with the conventions set in the previous literature that has used *CEX* data.

Appendix B: Creation of the Dependent Variables

The *CEX* has a constructed variable with information on “total expenditures.” We use this variable as our total consumption variable. According to the official *CEX* definitions, total expenditures includes the following: spending on food, alcoholic beverages, housing, apparel, transportation, health, entertainment, personal care, reading, education, tobacco, miscellaneous items, cash contributions, and personal care. All of these components have subcategories. For more information on what is included in the subcategories, please see the *CEX* documentation. Finally, the spending amounts on these components for the three months prior to the interview month are added together to create the total spending values.

Following BLS conventions, we also use the “total outlays” variable as a measure of total consumption. The “total expenditures” variable described above included the total cost of the items purchased in that period. Thus, if someone has financed a big ticket item and only paid a certain portion of it within the quarter in which he/she was interviewed, the amount paid will be included in the outlays variable. “Total spending,” however, will include the full price of the item even though it is not yet paid in full. Thus in order to capture the actual amount of spending for that quarter, we also use the “total outlays” variable as a measure of consumption.

Next we separate the total spending into durable and nondurable spending. Nondurable spending includes the following: spending on food, alcoholic beverages, utilities, apparel, tobacco, and gasoline, and motor vehicle-related expenses. Durable spending includes spending on housing and tv/radio/sound equipment. The breakdown of total consumption into durable and nondurable consumption is done individually by the authors and thus may vary among different users.

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