MODELING CREDIT CARD BORROWING BY STUDENTS

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ABSTRACT

Credit card use has become accepted practice in the US even for students. This places students at risk of creating debt that they may be unable to repay. This paper estimates the borrowing and amount of borrowing decisions jointly using the Tobit model, and the two-step estimation approach that allows for separate estimations. The two models yielded similar results, although qualitative differences were found in four variables: income, race, attitude towards debt and college major. After controlling for socio-economic and attitude effects, other credit card characteristics appear to be more important than interest rate in influencing student credit card borrowing.

INTRODUCTION

Easy access to credit cards, associated with aggressive marketing by the credit card industry, combined with the increasing social pressure to enjoy a more extravagant college life style are believed to increase the likelihood of students building up debt. This adds to the total debt burden faced by college students when combined with student loans to finance their education. Average credit card usage among college students in terms of outstanding debt, the percentage of students with cards, and the average number of cards per student has increased to significant levels in recent years. The Nellie Mae report [16] suggests that a market saturation point may have been reached and that the percentage of students who have cards may hover around 80 percent.

Studies that are specific to credit card use among college students investigate and relate spending habits and money attitudes to credit card use and how this could lead to a potential financial problem. Hayhoe, et. al. [11, p. 122] found that attitudes towards using credit cards and gender influenced purchasing on credit by college students. Roberts and Jones [18, p. 225], using a sample of American college students, examined the role of attitude towards money and credit card use in compulsive buying and found results that suggest credit cards facilitate compulsive buying of unnecessary goods. Related studies by Cunningham [8] and Norvilitis and Santa Maria [17] likewise found that although a majority of the students are responsible and can handle their credit well, there is a significant minority who were having problems. Thus, these studies emphasized the need for on-campus financial education or counseling.

The demand for credit is related to the desire to finance higher levels of current consumption than would otherwise be available. The demand for credit card

borrowing is a part of an individual's demand for credit. This study will focus on identifying and estimating various factors that influence the university student's demand for credit card borrowing. Much of the research on college credit card debt has been devoted to tabulations of the number of credit card accounts and balances by demographic characteristics. Very few studies consider the factors that influence individual student decision-making about credit card
usage. In this paper, econometric models and empirical estimation procedures examine credit card borrowing among college students. These models incorporate demographic, economic, and attitude considerations into student decision making.

MODEL SPECIFICATION

Based on consumer choice theory, the individual demand for credit card usage, CCU_i, among college students can be specified as:

$$CCU_i = f(P_i, D_i, E_i, A_i) \tag{1}$$

where P_i is the price of credit measured by the average annual percentage rate (APR) of credit card accounts; D_i is a vector of demographic variables; E_i is a vector of economic variables including income; and A_i is a vector of dummy variables for student attitudes toward credit card use and debt in general.

The historically slow response of credit card interest rates changes compared to changes in money market rates has been investigated by Ausubel [1, p. 53], Calem and Mester [4, p. 1327] and Cargill and Wendel [5, p. 375]. Ausubel attributes the stickiness of credit card interest rates to the irrationality of credit card holders, i.e. they do not look for lower interest rates because they expect to use the cards as only a transactions medium, and even after they discover that they use credit cards as a borrowing medium, they do not learn from their experience. Calem and Mester add that search and switch costs for the card holders and adverse selection for firms contributes to the stickiness of credit card rates, confirming the claim that credit card rates are sticky because consumers are not responsive to rate cuts. Cargill and Wendel, on the other hand support the view that household indifference to interest rates is a rational behavior if in fact other credit card characteristics are more important than interest rates.

Min and Kim [15, p. 136] found that households are responsive to interest rates when deciding to borrow, but not when deciding how much to borrow. Economic theory indicates that credit card balances should fall as the average APR increases, thus, a negative coefficient estimate for P_i is expected. However, previous studies suggest that a statistically insignificant coefficient might be expected.

Key economic variables under E_i are income, employment status, and credit constraint. In theory, the relationship between credit card balances (CCB) and income is uncertain as higher levels of income may imply no borrowing constraints or a lesser need to borrow. Both Cargill and Wendel [5, p. 384] and Min and Kim [15, p. 136] empirically show that income negatively affects the likelihood of borrowing on credit cards, but is positively related to the amount borrowed. Intuitively, students who are credit constrained will have a higher demand for credit card borrowing, because they have greater need and are likely to be denied other forms of credit.

Student preferences in terms of willingness to borrow are also accounted for in the vector of attitudinal variables, A_i. In general, more accepting and positive student attitudes towards credit card use and debt overall is expected to lead to higher demand for credit card borrowing.

To control for demographic differences, the vector of explanatory variables under D_i includes age, racial group, gender, marital status, student classification, and major. Age and student classification, like the income variable, can have a positive or negative impact on credit card balances. Both of these variables affect the amount of desired credit and the ability to obtain credit. Younger and lower level students may have a stronger desire for credit in the sense that they have less maturity or experience in dealing with the implications of credit card debt and are more likely to want immediate gratification and consumption financed through such debt. On the other hand, they may have less ability to obtain the credit that they want. It is also hypothesized that students majoring in business are less likely to incur higher credit card debt relative to other majors given that they have better exposure and information on the importance of responsible personal financial management from their course work.

Table 1
Variables and Summary Statistics

VARIABLE	DEFINITION	MEAN	STANDARD DEVIATION
CCB	Credit card balance ($)	985.38	1,573.88
BD	1 if student currently carries credit card balance	0.73	0.45
INT	Average interest on all credit cards (%)	10.72	6.11
INC	Student income from all sources in the last year ($)	15,702.79	15,265.41
AGE	Age of student	23.44	6.58
SEX	1 if respondent is male	0.35	0.48
SO	1 if respondent is a sophomore	0.13	0.33
JR	1 if respondent is a junior	0.25	0.43
SR	1 if respondent is a senior	0.42	0.49
GR	1 if respondent is a graduate student	0.12	0.32
RACE	1 if white	0.95	0.23
MS	1 if married	0.17	0.37
WORK	1 if currently employed	0.78	0.41
MAJOR	1 if student is from College of Business and Leadership	0.29	0.46
LOAN	1 if student do not have student loans	0.28	0.45
BAL	1 if student pays more than the minimum but not the full monthly balance	0.90	0.31
NCC	Number of credit cards	1.79	1.10
CC	1 if applied for credit card last year and rejected and if requested a credit line increase and rejected	0.14	0.34
COST	1 if extensive knowledge of how much debt will ultimately cost	0.63	0.48
STYLE	1 if agree that debt is a normal part of today's lifestyle	0.61	0.49

Note: binary variables have zero values if "otherwise" from coding value of 1.

DATA

The data used in the empirical analysis is from a self-administered mail survey of Fort Hays State University (FHSU) students that collected information about student financial resources, spending patterns, employment activities, and credit card debt. The survey was administered in the spring semester of 2005 from a random sample of 1500 undergraduate and graduate students at FHSU. There were 411 responses.

Since this study examined credit card borrowing, students must have had at least one bank credit card (Visa, MasterCard, etc.) and as a consequence, the sample size was reduced to 278 students.[1] After considering complete item responses to the variables specified in the empirical models, 243 students remained in the final sample. Detailed variable descriptions and summary statistics are provided in Table1.[2]

METHODOLOGY

Credit card debt functions have been estimated using the traditional Tobit model (Kinsey [13, p. 173], Calem and Mester [4, p. 1331], Chien and DeVaney [6, p. 169]). Because the Tobit model restricts the sign and magnitude of the coefficients of participation and utilization to be the same, although there is no a priori reason to assume this, the two-step estimation approach has been used to overcome the possibility of model misspecification. Blaylock and Blisard [2, p. 700] have used the two-step estimation approach to model cigarette consumption and Byrne, Capps, and Saha [3, p. 616] to model food-away-from-home expenditures. With regard to studies about debt, the two-step estimation procedure has been utilized by Duca and Whitesell [9, p. 606] to model credit cards and money demand; Crook [7, p. 84] to model demand for household debt; and Cargill and Wendel [5, p. 381] and Min and Kim [15, p. 132] to model credit card borrowing. This paper will present both the Tobit and the two-step estimation approaches in the statistical analysis. The Tobit model estimates the borrowing decision and the amount borrowed jointly which requires the signs of the parameter estimates for these two separate decisions to be the same. This may not necessarily hold. The income variable, for example, may have a negative sign if higher income reflects the likelihood of borrowing (which reflects "need"); however, the sign may be positive if higher income increases the likelihood of borrowing (which reflects "ability to pay"). By utilizing the two-step approach, different marginal effects for the borrowing decision and for the amount borrowed can be estimated. The two-step approach will address the possibility of sample selection bias since the dependent variable (credit card balance) is observed only for a restricted, nonrandom sample (those who report positive balances).

Tobit Model Specification

The general formulation of the Tobit model is given by: (Greene [10, p. 908])

$$Y_i^* = \beta' X_i + \varepsilon_i \quad , Y_i = 0 \text{ if } Y_i^* \le 0 \text{ and } Y_i = Y_i^* \text{ if } Y_i^* \succ 0 \qquad (2)$$

where Y_i^* is a latent variable and Y_i is the observed variable, in this case the amount of credit card balances. Explanatory variables (X_i) include interest rate, income,

demographics, attitudes, and other factors described in the previous section. Considering the model given in (2) and the observed variable Y_i, we have: (Maddala [14, p. 158])

$$E(Y_i / Y_i \succ 0) = \beta' X_i + \sigma \frac{\phi_i}{\Phi_i} \tag{3}$$

where ϕ_i and Φ_i are the standard normal density function and distribution function evaluated at $\beta' X_i / \sigma$.

On the basis of the theoretical considerations, credit card borrowing is specified as:

$$\begin{aligned} Y_i^* = {} & \beta_0 + \beta_1 INT_i + \beta_2 INC_i + \beta_3 AGE_i + \beta_4 SEX_i + \beta_5 MS_i + \beta_6 RACE_i \\ & + \beta_7 SQ_i + \beta_8 JR_i + \beta_9 SR_i + \beta_{10} GR_i + \beta_{11} WORK_i + \beta_{12} COST_i \\ & + \beta_{13} STYLE_i + \beta_{14} MAJOR_i + \beta_{15} LOAN_i + \beta_{16} CC_i + \beta_{17} NCC_i + \beta_{18} BAL_i + \varepsilon_i \end{aligned} \tag{4}$$

where the explanatory variables are defined (with summary statistics) in Table 1. A positive credit card balance $\left(Y_i^* = CCB_i\right)$ is observed if the latent variable $Y_i^* > 0$ and a zero balance if $Y_i^* \leq 0$.

Two-step Model Specification

Building on the specification of Heckman [12, p. 154], modified specifically for credit card borrowing gives:

$$Y_{1i}^* = \beta X'_{1i} + \nu_i \qquad \text{selection equation} \tag{5}$$

$$Y_{2i} = \alpha X'_{2i} + \mu_i \qquad \text{main equation} \tag{6}$$

where Y_{1i}^* is a latent variable, where we observe $Y_{1i} = 1$ when students are borrowing on credit cards and $Y_{1i} = 0$ when students have zero credit card balance. Y_{2i} is the credit card balance held which is observable only when $Y_{i1} = 1$.

The first step involves the probit regression of (5) to determine the probability of borrowing. OLS estimation of the sub-sample in (6) will result in sample selection bias (from an omitted variable) and Heckman provides a specification for the omitted variable called the inverse mills ratio (MILLS). For non-zero observations, Y_{2i}, the inverse mills ratio is $\phi\left(\beta X'_{1i}\right) \Big/ \Phi\left(\beta X'_{1i}\right)$, a ratio of the value

of the standard normal density function to the value of the standard normal cumulative distribution function, and is included as a regressor in the estimation of (6). This two-step estimation technique allows separate parameter estimates for the first stage (borrowing decision) and the second stage (amount borrowed) but links them through the inverse mills ratio (Byrne, Capps, and Saha [3, p. 617]).

For the two-step estimation model, two regression equations are run, the borrowing decision (probit selection equation) in (5) and the amount borrowed (main equation) in (6) given below:

$$\begin{aligned} Y_{1i}^{*} &= \beta_0 + \beta_1 INT_i + \beta_2 INC_i + \beta_3 AGE_i + \beta_4 SEX_i + \beta_5 MS_i + \beta_6 RACE_i \\ &+ \beta_7 SO_i + \beta_8 JR_i + \beta_9 SR_i + \beta_{10} GR_i + \beta_{11} WORK_i + \beta_{12} COST_i \\ &+ \beta_{13} STYLE_i + \beta_{14} MAJOR_i + \beta_{15} LOAN_i + \nu_i \end{aligned} \tag{7}$$

where the borrowing decision (BD_i) is observed

$$BD_i = 1 \; if \; Y_{1i}^{*} \succ 0 \; and \; BD_i = 0 \; if \; Y_{1i}^{*} \leq 0,$$

and

$$\begin{aligned} Y_{2i}^{*} &= \alpha_0 + \alpha_1 INT_i + \alpha_2 INC_i + \alpha_3 AGE_i + \alpha_4 SEX_i + \alpha_5 MS_i + \alpha_6 RACE_i \\ &+ \alpha_7 SO_i + \alpha_8 JR_i + \alpha_9 SR_i + \alpha_{10} GR_i + \alpha_{11} STYLE_i \\ &+ \alpha_{12} MAJOR_i + \alpha_{13} CC_i + \alpha_{14} NCC_i + \alpha_{15} BAL_i + \alpha_{16} MILLS_i + \mu_i \end{aligned} \tag{8}$$

where the dependent variable Y_{2i}^{*} is the credit card balance (CCB_i) given that $BD_i = 1$. The two equations are linked together by the inverse mills ratio $(MILLS)$[3]. If this variable is statistically significant, then sample selection bias is present.

EMPIRICAL RESULTS[4]

The empirical results derived through the Tobit model and the two-step estimation process described above is presented in Table 2. Unlike the parameter estimates in OLS regressions, which represent marginal effects of the explanatory variables, the coefficients estimated from the Tobit and probit models do not make immediate intuitive sense. Probit coefficients measure how much a unit change in the independent variable changes the cumulative normal probability of the dependent variable (Z scores). As such, the magnitude of the parameter estimate varies with the magnitude of the independent variables. Tobit coefficients, on the other hand, measure the marginal effect of the independent variable on the latent variable, not the observed variable, Y_i. It is shown in Greene [10, p. 909]; however, that the marginal effect on the observed variable is simply the parameter estimate multiplied by the probability of the noncensored observation. Since the estimated parameters cannot be directly interpreted, only the marginal effects of the explanatory variables on credit card borrowing are reported in Table 2, computed at the means of the $X_i s$. Actual parameter estimates are reported in Appendix A.

TABLE 2
MARGINAL EFFECTS FOR TOBIT AND TWO-STEP ESTIMATION MODELS

VARIABLES	TOBIT MODEL	TWO-STEP MODEL	
		BORROWING DECISION (SELECTION EQN)	HOW MUCH TO BORROW (MAIN EQN)
Constant	-682.76 (589.90)	0.22 (0.27)	-434.64 (870.22)
INT	-2.71 (11.76)	0.002 (0.01)	-16.73 (17.00)
INC	0.01 (0.01)**	0.00006 (0.00003)**	0.01 (0.01)
AGE	31.24 (13.22)**	0.004 (0.006)	51.30 (18.69)**
SEX	47.18 (152.62)	-0.02 (0.06)	239.12 (225.83)
MS	-207.76 (251.73)	-0.22 (0.13)*	145.32 (380.49)
RACE	-650.29 (318.30)**	-0.24 (0.04)**	-386.17 (424.93)
SO	232.21 (315.72)	0.04 (0.11)	146.19 (486.66)
JR	214.48 (283.85)	0.08 (0.09)	104.55 (440.28)
SR	369.76 (270.71)	0.18 (0.09)*	179.89 (430.77)
GR	137.80 (326.48)	0.07 (0.11)	84.88 (493.54)
WORK	389.87 (199.08)**	0.29 (0.09)**	
COST	-79.56 (150.60)	-0.04 (0.06)	
STYLE	443.07 (160.35)**	0.13 (0.07)*	336.15 (282.38)
MAJOR	-293.47 (156.13)*	-0.12 (0.07)*	-371.76 (236.92)
LOAN	-282.07 (166.75)*	-0.22 (0.07)**	
CC	553.71 (204.87)**		834.76 (285.57)**
NCC	329.81 (69.98)**		587.68 (98.78)**
BAL	-520.81 (246.92)**		-838.31 (338.59)**
MILLS			152.28 (554.70)
	LR stat = 108.95 p-value = 0	Pred Accuracy 0.76 $\chi^2_{16} = 52.04$ $p - value = 0$	$\chi^2_{17} = 115.56$ $p - value = 0$

* and ** indicate 10% and 5% significance levels, respectively. Standard errors are in parentheses.

The regression results presented below support the general conclusion that student credit card balances are systematically related to the explanatory variables in the two models as demonstrated by the overall goodness of fit measures for the models. In the Tobit model, the likelihood ratio statistic (LR) of 108.95 (p-value =0) confirms that this model provides a better fit versus the alternative model where all the parameter estimates are jointly zero. The prediction accuracy of 76% also implies a good fit for the selection probit equation model and the overall model significance test for the main equation in the two-step model also returned a significant model. From the last column in Table 2, it can be concluded that sample selection bias is not a problem (model misspecification), because the parameter estimate for the inverse mills ratio (MILLS) is not statistically significant (p-value = 0.97). Thus, for our data set, the Tobit model, which restricts the borrowing and amount of borrowing decisions into a single parameter estimate, is an acceptable specification of the credit card borrowing equation.

It is interesting to note that one of the key variables, interest rate (INT), does not significantly affect the students' decision to borrow or how much to borrow in either the Tobit or the two-step models. This is consistent with Ausubel's [1, p. 71] argument of credit card consumer irrationality and Calem and Mester's [4, p. 1327]

empirical finding that credit card rates are sticky because consumers are not responsive to rate cuts. On the one hand, this may be more a reflection of the population considered in this study ─ students. It is perhaps more acceptable to believe the argument of consumer irrationality if the consumer group is students. Students are more likely to be impulsive and fall prey to instant gratification by using credit cards to finance consumption, and may place less importance on the future implications and consequences of going into debt. Min and Kim [15, p. 136] found that for households, interest rates negatively affect the amount of borrowing in the Tobit model, whereas in the two-step model, interest rate had no significant effect on the amount of borrowing, only on the borrowing decision. This finding was not confirmed in this study.

Another important economic variable is income (INC). In the Tobit model, income is a significant determinant of credit card balances for students, and the magnitude seems reasonable: for each $100 increase in a student's income, credit card balances increase by $1. For the two-step model, income positively affects the decision to borrow, but has no significant effect on the amount borrowed. These results would support the hypothesis that higher income may imply no borrowing constraint. Consistent with the coefficient on INC, a student who is currently employed is 29% more likely to borrow according to the result from the two-step model selection equation. In the Tobit model, an employed student has on average, $390 more in credit card debt, than a student not currently working.

Students who have been rejected by another credit card application and/or a credit line increase within the last year (CC) have, in the Tobit model, $554 more debt and $835 more debt in the two-step model. Calem and Mester [4, p. 1333] investigated the simultaneity between credit card debt (CCB) and credit constraint (CC), which would imply that the parameter estimates here will be inconsistent if CC is in fact not exogenous. A test for the exogeneity of CC was performed where the null hypothesis is CC is exogenous following the procedure from LIMDEP which is a simple t-test for the hypothesis that $\rho[\varepsilon_1, \varepsilon_2] = 0$, where ε_1 and ε_2 are the error terms from the CCB Tobit model and the model where CC is
the dependent variable, respectively. The t statistic was calculated to be 0.059 with a p-value = 0.9528, therefore, CC is exogenous. As hypothesized and empirically supported by Min and Kim [15, p. 137], credit constrained households who are likely to be denied other forms of credit have higher demand for credit card borrowing. The results of this study also show a similar situation for students.

Multiple credit cards (NCC) increase the available funds for borrowing and the likelihood of using the funds which may be manifested in higher balances held. The Tobit model shows that an additional credit card held by a student will increase credit card balances by $330, while the two-step model estimates a $588 increase. On the other hand, the premise that people obtain more cards to allow for larger balances (Cargill and Wendel [5, p. 384]) may indicate NCC is endogenous in this model. Following the procedure for testing for exogeneity performed above for the variable CC, a similar test is performed here where results show NCC is in fact exogenous (t-stat = 0.002, p-value = 0.9983). Similarly, students who regularly pay more than the minimum but not the full balance monthly (BAL)[5] have $521 and $838 less balance than students who fail to pay the minimum balance as per the Tobit model and the two-step model, respectively.

Credit card balances are positively related to the student's age, consistent with the hypothesis that older students have more credit card debt since they may

have more access to credit and more ability to pay. However, age does not significantly affect the decision to borrow according to the result from the two-step model. On the other hand, Calem and Mester [4, p. 1332] and Min and Kim [15, p. 137] found that for households, balances are negatively related to age, and older households are less likely to use credit cards for borrowing than younger households. This is more consistent with the premise that age reflects on the amount of desired credit, which intuitively should be lower for older households.

In terms of race, white students are 24% less likely to borrow compared to nonwhites[6] but do not significantly impact the balance held as indicated by the two-step model. The Tobit model, however, points out that white students have approximately $650 less credit card debt. These are all consistent with household behavior and the hypothesis that nonwhites may have less access to alternative types of credit than do whites (Calem and Mester [4, p. 1332], Cargill and Wendel [5, p. 385], and Min and Kim [15, p. 136]).

Marital status (MS) was not found to affect the amount of balances in both models, but the selection probit equation in the two-step model indicates that a married student is 22% less likely to borrow than a single student. In the same manner, although a senior is 18% more likely to borrow than a freshman, the student's academic classification does not influence the amount of credit card borrowing. Results from the selection equation of the two-step model likewise imply that a student majoring in business has a lower likelihood of borrowing (MAJOR) compared to students from other colleges, but has no significant effect on the amount of balances held (from the main equation). The Tobit model, on the other hand, suggests that a student majoring in business has $294 less credit card debt relative to students from the three other colleges in the university. It might be inferred that students who have more exposure to financial management as a result of being a business major, are more prudent in their credit card debt compared to non-business majors.

A student without student loans is 22% less likely to borrow (two-step model) and has $282 less in credit card debt (Tobit) than a student also burdened with student loans. It would seem that credit card debt does add to the overall debt burden of students.

Extensive knowledge on how much credit card debt will ultimately cost does not significantly influence the borrowing decision (from selection equation of two-step model) and the amount of balance held (Tobit model). This is actually consistent with the results on the INT variable, which is likewise not significant. However, a student who agrees that debt is a normal part of today's lifestyle is 13% more likely to borrow and has almost $443 more debt, based on the two-step model and the Tobit model, respectively.[7]

CONCLUDING COMMENTS

This research represents an initial effort of modeling credit card borrowing of students using econometric models that are anchored on the economic theory of consumer behavior that incorporates demographic, economic and preference considerations into the decision making process. Previous research using this approach has focused mainly on household credit card borrowing, while work on student credit card borrowing has been mostly restricted to cross-tabulations. Where econometric models were incorporated, the set of explanatory variables were limited.

Credit card usage is a two part decision for any person: (1) shall the card be used (borrowing decision); (2) and if so, to what extent (amount of borrowing). The empirical findings in this paper suggest that the traditional Tobit model, which combines the borrowing and the amount of borrowing decisions into a single estimation, is an acceptable specification of modeling student credit card borrowing. Results from the two-step estimation approach did not provide evidence of sample selection bias (model misspecification), but provided additional information to the results of the Tobit model. Overall, the two approaches yield similar results, although there were some qualitative differences on four variables – INC, RACE, STYLE and MAJOR. From the Tobit model, credit card borrowing increases with income, while in the two-step model, higher income increases the likelihood of borrowing, but has no significant impact on the credit card balance held. Whites have lower balances according to the Tobit model; however, according to the two-step model, there is no statistically significant difference between whites and nonwhites in terms of the amount of borrowing, but whites are less likely to borrow. A more accepting attitude towards debt as a lifestyle leads to higher balances in the Tobit model, but in the two-step model, although it (STYLE) increases the probability of borrowing, it has no impact on the level of debt. A similar relationship is demonstrated by the variable MAJOR ─ a student from the business major has less debt than a student from other majors as per the Tobit model; on the other hand, the two-step model predicts a student from the business college is less likely to borrow, but the balance held is no different from a student from another college.

Another key result is that student credit card borrowing does not seem to be influenced by interest rate, consistent with Ausubel's hypothesis of consumer irrationality, which seems a more plausible explanation for students than for households in general. After controlling for demographic, economic, and attitude (preferences) effects, other credit card characteristics seem to be more important than interest rate in influencing student credit card borrowing. These include the number of credit cards held, and credit card constraints faced by the student. Consequently, if policy makers and university officials were to pursue policies designed to moderate credit card debt of students, it might focus on credit card solicitation. Given the fact that students do use credit cards for borrowing, it might also help to improve financial training and literacy of students, particularly on the issue of how much their debt ultimately costs them.[8]

APPENDIX A
ACTUAL PARAMETER ESTIMATES FROM THE TOBIT AND TWO-STEP ESTIMATION MODELS.

VARIABLES	TOBIT MODEL	TWO-STEP MODEL	
		BORROWING DECISION (SELECTION EQN)	**HOW MUCH TO BORROW (MAIN EQN)**
Constant	-1030.52 (895.21)	0.72 (0.92)	-434.64 (870.22)
INT	-4.09 (17.75)	0.01 (0.02)	-16.73 (16.99)
INC	0.02 (0.01)**	0.0002 (0.00001)**	0.01 (0.01)
AGE	47.16 (19.86)**	0.01 (0.02)	51.30 (18.69)**
SEX	71.21 (230.28)	-0.07 (0.21)	239.12 (225.83)
MS	-313.59 (380.14)	-0.65 (0.36)*	145.32 (380.49)
RACE	-981.52 (480.75)**	-1.49 (0.69)**	-368.17 (424.93)
SO	350.49 (476.71)	0.13 (0.39)	146.19 (486.66)
JR	323.72 (428.65)	0.30 (0.35)	104.55 (440.28)
SR	558.09 (408.47)	0.61 (0.33)*	179.89 (430.77)
GR	207.98 (493.01)	0.23 (0.43)	84.88 (493.54)
WORK	588.45 (301.26)**	0.84 (0.25)**	
COST	-120.08 (227.27)	-0.13 (0.21)	
STYLE	668.74 (241.39)**	0.41 (0.21)**	336.15 (282.38)
MAJOR	-442.95 (235.58)*	-0.39 (0.21)*	-371.76 (236.92)
LOAN	-425.73 (252.36)*	-0.68 (0.21)**	
CC	835.74 (307.72)**		834.76 (285.57)**
NCC	497.79 (100.90)**		587.68 (98.78)**
BAL	-786.08 (371.03)**		-838.31 (338.60)**
MILLS			152.28 (554.70)

* and ** indicate 10% and 5% significance levels, respectively. Standard errors are in parentheses.

ENDNOTES

[1] 68% of the students surveyed had at least one credit card in their name; this includes charge accounts from retail store cards and gas cards.

[2] For a summary report on the credit card debt portion of the survey, see Arano (2006), which shows behavioral patterns. Conclusions derived from these simple cross-tabulations should however be treated with caution, and to better test causal relationship of credit card debt to demographic, economic, and attitudinal variables, consider results from this paper.

[3] For identification, it is required that there should be some X in the selection equation not included in main equation. The variables excluded from the main equation could still affect the CCB equation through the inverse mills ratio (Maddala [14, p. 233].

[4] The reported results, while they perhaps yield some insight into the national picture, are based on a sample of students from a smaller university in western Kansas and may not be representative of a national sample of students.

[5] It is likewise possible for BAL to be endogenous -- higher credit card balances may increase the likelihood that the student is not able to pay off the minimum monthly balance. The exogeneity of BAL was therefore tested using similar procedures discussed earlier and the test shows BAL is exogenous in this model (t-stat = -0.91, p-value = 0.9272).

[6] The RACE variable was represented with either White or Non-White (includes Black, American Indian, and Asian/Pacific Islander). Although the Non-White group might show a significant variation within itself, it was not further disaggregated as the number of observations within each of these sub groups was too small. The Non-White maybe considered as the minority racial group.

[7] Again, it is possible that because a student has substantial credit card debt, the student is more likely to agree that debt is a normal part of today's lifestyle. This might be a rationalization of the student's behavior. If this is the case, STYLE maybe endogenous in this model but the test for exogeneity indicate it is exogenous (t-stat = 0.031, p-value = 0.9756).

[8] These results are based on a survey which opens the possibility of bias in the form of self-selection issues for those who choose to answer the survey. Although the survey also included questions other than those about credit card debt, ultimately, as with other surveys, the researchers have no control on whether a student chooses to participate in the survey or not, which may result in a nonrandom sample. The results presented should therefore be taken with this in mind.

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