Overcoming Information Asymmetries in Low-Income Lending:
Lessons form the "Working Wheels" Program

by

Jessica Holmes, Jonathan Isham, and Jessica Wasilewski

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MIDDLEBURY COLLEGE
MIDDLEBURY, VERMONT 05753

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Overcoming Information Asymmetries in Low-Income Lending:
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Jessica Holmes, Jonathan Isham, and Jessica Wasilewski

Middlebury College

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Abstract: This study analyzes the role of relationship lending in the automobile credit market among a population generally perceived to be high risk – and thereby 'unlendable'. Using a unique dataset from the Vermont Development Credit Union's "Working Wheels" low-income car loan program, we find that the strength of the relationship between creditor and higher risk borrowers significantly raises the probability of loan approval, and that such borrowers who receive loans are relatively creditworthy. Specifically, for applicants without credit scores, we find that -- in addition to income and debt ratio -- age and the nature of the established relationship with the lender significantly affect the probability of loan approval   By contrast, for applicants with credit scores, only income, debt ratio and the credit score are the significant determinants. In addition, despite the greater information asymmetry associated with applicants whose credit histories are unknown, we find no significant difference in delinquency rates between those with and without credit scores. In the current climate of welfare reform, we conclude that policymakers should consider programs that encourage welfare recipients to establish relationships with traditional financial institutions and establish more programs like "Working Wheels" that facilitate access to affordable credit for automobiles.

Keywords: low-income lending; relationship lending; information asymmetries; automobile loans; credit-rationing.

JEL Codes: H53; I38; R42

I. Introduction and Literature Review[1]

"Money, says the proverb, makes money. When you have got a little, it is often easy to get more. The great difficulty is to get that little."

-Adam Smith, Wealth of Nations, 1776.

Welfare reform in the 1990's marked an important transition from income maintenance programs that encourage welfare dependency toward welfare-to-work policies that promote economic self-sufficiency. The crucial role of transportation is often overlooked, yet without access to reliable transportation, the welfare-to-work transition is nearly impossible. In fact, recent evaluations of the welfare-to-work reforms have cited lack of transportation as a major barrier to job search, employment and self-sufficiency (Danziger et al, 2000;Goldberg, 2001). In particular, lack of access to an automobile has been associated with a difficult transition from welfare to financial autonomy. Car ownership reduces commuting time, widens the geographic area for job search, improves job attendance and expands childcare options; not surprisingly, it is positively associated with the probability of being employed, hours worked, and earnings among the poor (Danziger et al 2000; Holzer et al 1994); Ong 1996; O'Regan and Quigley 1997; Polit and O'Hara 1989; Raphael and Rice 2002.) Despite the proven benefits of car ownership, Murakami and Young (1997) find that 36 percent of low-income single parents do not have a vehicle, compared to 4 percent of middle and upper income households.

Access to a car is particularly important in rural areas where public transportation, car-pooling, and other ride share opportunities are not well established. Nearly 40 percent of rural counties in the United States have no public transportation (Rucker 1994), thus many rural employers expect or require that employees have access to reliable private transportation. However, many welfare recipients and other low-income individuals, especially those who are jobless, lack the savings or income necessary to purchase a car; income cannot be attained without transportation and transportation cannot be attained without income. This cycle is intensified when one considers that most welfare-to-work recipients are subject to strict work or job training requirements that often require transportation. In some states, low-income individuals who cannot secure mandated employment or job training are penalized through either partial or total loss of welfare benefits (Goldberg 2001).

In a world of certainty and perfect information, low-income households might overcome the transportation barrier through the automobile credit market. However, an extensive theoretical literature confirms that asymmetric information between borrower and lender can lead to excess demand in traditional credit markets (Jaffee and Russell 1976; Stiglitz and Weiss 1981; Williamson 1987; Jaffee and Stiglitz 1990). Under conditions of asymmetric information, rationing by price may lead to adverse selection since rising interest rates increase the average "riskiness" of the borrower, potentially reducing profit per dollar lent. Thus, a "bank-optimal" interest rate can emerge at a rate lower than is necessary to clear the market, but above which expected profit per lent dollar falls. Not surprisingly, many poor households report an inability to secure an affordable car loan through traditional financial institutions, particularly since these

institutions often are legally prohibited from raising interest rates above state-established ceilings (for example, 20 percent in Vermont). Empirical evidence verifies that low-income households are more likely to be credit rationed than their high-income counterparts (Attanasio, Goldberg and Kyriazidon 2000).[2, 3]

In order to distinguish borrowers with higher probabilities of repayment from potentially less capable borrowers, traditional lenders employ a number of screening devices to predict loan default. Recent improvements in methodology, computer power and data access have enhanced the predictive power of credit scoring and thus increased the reliance on credit score as a tool to overcome many of the informational asymmetries in the credit market. Some lenders rely almost exclusively on credit score to determine loan approval (Mester 1997). However, since low-income individuals may have difficulty establishing credit and therefore credit scores, they are more likely to be rationed out of the market.[4] In fact, "insufficient or no credit history" is a cited reason for loan denial at many traditional banks. As credit score is increasingly relied upon as a predictor of loan repayment, lenders must rely on other applicant characteristics when credit score is unavailable. In particular, the relationship between borrower and lender can reduce information asymmetries, lower the cost of financial capital and thereby decrease the probability of being credit rationed.

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[2] Note that some households rationed out of the traditional credit market may acquire financing through predatory lenders that charge annual interest rates over 20 percent, impose stiff penalties on pre-payment or delinquency, and target the financially unsophisticated.
[3] According to Peterson and Ginsberg (1981), interest rates on auto loans are higher in rural areas due to limited competition. One might thereby expect that low-income households in rural areas face greater barriers to affordable credit.
[4] Estimates suggest that between 4 million and 19 million Americans over the age of 18 have no credit score. Many of those are immigrants, older or too poor to qualify (Lewis , *The Seattle-Times*, 2001).

Several recent studies have shown that strength and duration of the applicant's relationship with the lender is likely to have a positive effect on credit availability and loan terms. For example, three studies use the Federal Reserve Board's National Survey of Small Business Finances to study the impact of relationship lending on credit availability for small firms. While Petersen and Rajan (1994) do not find a significant association between relationship duration and the interest rate on the firm's most recent loan, they do find that the interest rate increases with the number of banks from which the firm borrows and decreases with firm age. In contrast, Berger and Udell (1995) find that the length of a small firm's relationship with its lending institution significantly decreases the interest rate charged and the collateral required for floating lines of credit. Cole (1998) finds that a lender is more likely to extend credit to a firm with which it has a prior financial relationship, although duration of the relationship is immaterial. Blackwell and Winters (1997), using loan files from six banks, find that lending rates for small business loans decrease as the strength of banking relationships increase. Lastly, Siles, Hanson and Robison (1994), by submitting hypothetical loan requests to over 100 small town banks, document the important role of social capital[5] in the availability of small business credit, particularly for the borrower whose financial strength is marginal.

Relatively little is known about the role of relationship lending in the consumer loan market, despite the fact that household borrowing constitutes a larger fraction of the overall loan market than business loans (Flow of Funds Accounts of the United States,

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[5] After Woolcock (1998), social capital can be defined as 'the networks and norms that facilitate the diffusion of information and collective action.'

2002)[6]. Using the Federal Reserve Board's Survey of Consumer Finances, Chakravarty and Scott (1999) show that both the length of the relationship with the lender and the number of asset accounts/loans with the creditor significantly decrease the likelihood that a consumer is credit-rationed. Again, since low-income borrowers -- and particularly welfare recipients -- have little opportunity to establish strong banking relationships or invest in their own social capital with lenders, they are more likely to be rationed out of the credit market.[7]

Several states have recognized the need to assist low-income residents obtain affordable financing for the purchase of automobiles, while helping them establish positive credit histories and build relationships with banking institutions.[8] This paper focuses on the "Working Wheels" program of the Vermont Development Credit Union (VDCU), a TANF-funded program that has provided car loans since 1998 to low-income Vermonters who are unlikely to obtain affordable loans elsewhere. We exploit the richness of the full sample of Working Wheels loan applications and a set of extensive interviews with Working Wheels clients to explore the credit allocation process of this program, the payment history of its loan recipients, and the private benefits to successful applicants. In doing so, we extend recent research on credit markets and lending practices in several ways. First, while the literature on credit rationing in the business and mortgage market is extensive, much less is known about credit availability for used car loans. Second, we analyze credit rationing within a welfare-to-work loan program

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[6] Specifically, in 2001 total outstanding household debt was $7693 billion compared to $6921 billion for total outstanding business debt (Federal Reserve, Flow of Funds Accounts for US).
[7] A 1999 study by Hogarth and O'Donnell suggests that 25 percent of all low- income households in the United States do not have transaction accounts (defined as either checking or savings).
[8] See Goldberg (2001) for a description of numerous state and national programs.

designed to lend to the "unlendable", a population that receives little attention in the literature. Third, while other studies have explored the importance of relationship lending, most previous work focuses on small business loans, whereas we focus on the importance of social capital in the allocation of consumer loans. Fourth, instead of relying on firm/household financial surveys or hypothetical loan applications, we use loan applications and thus focus on the information used in actual credit decisions. Finally, to our knowledge, no other study investigates the impact of relationship lending separately for those with and without a credit score. By stratifying our sample by presence of credit score, we show that the lender/borrower relationship mitigates the information asymmetry that impedes the flow of credit to those without credit histories, but has little impact on loan approval for those with credit scores.

The remainder of this paper is organized as follows. Section II provides more detailed information on the VDCU and the Working Wheels program. Section III outlines our empirical strategy and describes the data while Section IV describes the empirical results. Section V reviews the delinquency rates of the Working Wheels clients, and Section VI provides a discussion of the private benefits of the Working Wheels program. Section VII concludes with the policy implications.

II.   VDCU and the Working Wheels program

> *"Having a car is a big deal in Vermont, especially in the rural areas because how else are you going to get around? I really needed a car so I could get work but I didn't have the money- it was a real problem. I went to VDCU because their interest rates were much lower than the used car dealer's. They were really nice about everything and helped me find a good car for me …and they set me up with a plan of $129 a month. It was hard, but I did it…In the end it (the car) really made the difference for me…*

A Working Wheels client

The VDCU, a non-profit financial institution founded in 1989 in Burlington, Vermont, caters to traditionally unlendable clients. The VDCU's mission is "to create wealth and promote economic development by bringing affordable capital and financial services to low-income and other traditionally underserved people". As of June 2002, the VDCU served over 9,400 members. In 2001 alone, it loaned over $16.4 million to low- and moderate-income Vermonters (www.VDCU.org).

Working Wheels, a low-income lending program at the VDCU[9], provides automobile loans to low-income residents of Vermont. The program began in 1998 as a response to the lack of adequate public transportation in Vermont and the subsequent necessity of private automobile access for workers. Nearly all Working Wheels clients are referred to the VDCU by one of the five Community Action Agencies (CAAs) in the state. Those who are not referred by CAAs are generally already VDCU members, or are referred by friends, employers, or car dealers.

Most participants in the Working Wheels program are from low-income households, defined in Vermont as those with incomes less than or equal to 80 percent of median regional household income or $28,168 (US Census Bureau 2001).[10] Credit histories are typically limited or poor for Working Wheels applicants. Fifty-seven percent of Working Wheels applicants have no credit score; among the 43 percent with a credit score, more than three out of every five applicants score below 600 (the point at which national delinquency rates exceed 50 percent). Figure 1, which compares the

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[9] The VDCU also has lending programs for housing and small business development.
[10] It is not atypical for Working Wheels participants with dependents to have household incomes less than half of this amount.

distribution of credit scores of the Working Wheels applicants to the US population[11],

highlights the perceived risk of Working Wheels applicants.

Figure 1: Credit scores in the US and for Working Wheels
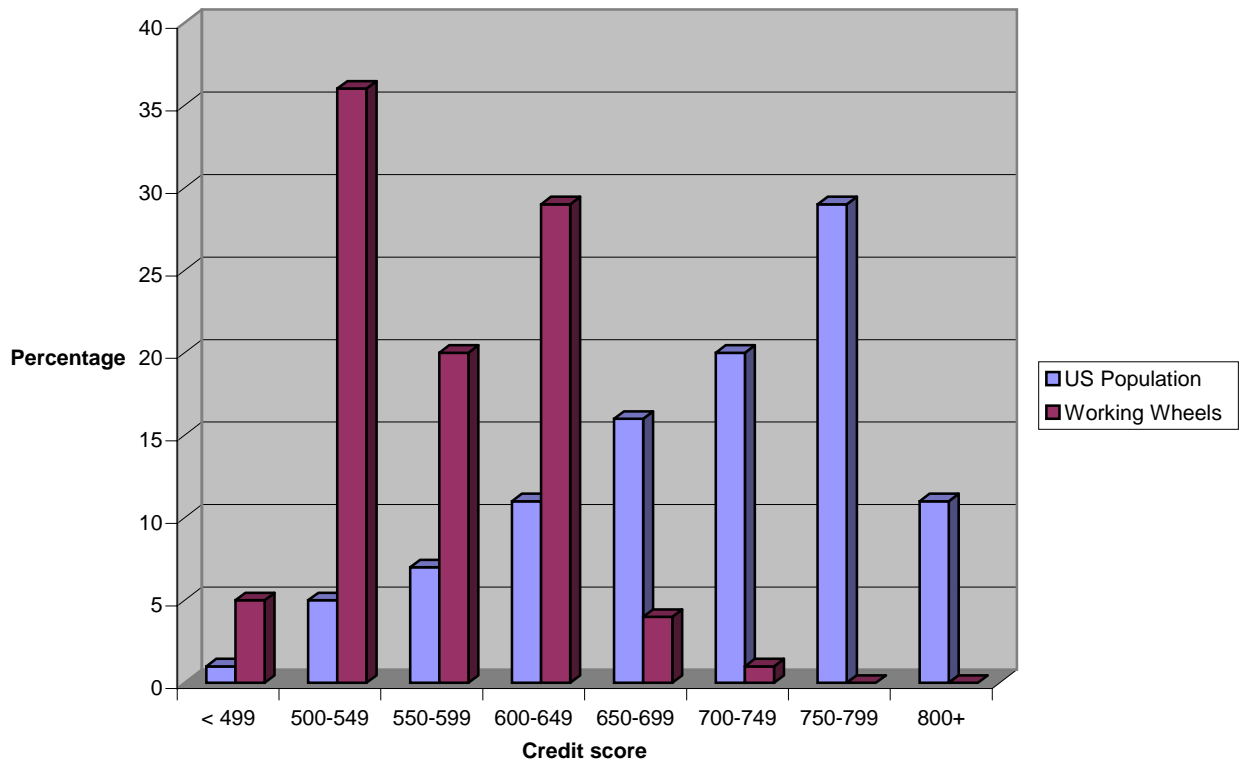
As of June 2002, the VDCU had financed almost 300 car loans totaling $685,220.

Loans have ranged in size from $75-$10,700, and the average loan is $2580. Working

Wheels loans can be used for either car purchases or repairs; the interest rate is typically

9.5 percent if the car is used as collateral or 14.5 percent if the loan is unsecured.

Working Wheels interest rates are less than what low-income applicants with poor or

limited credit history would obtain from other lenders in Vermont. For example,

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[11] The source for the US data in Figure 1 is www.myfico.com.

according to Fair Isaac and Company, a leading credit scoring agency, individuals with credit scores between 500 and 589 typically pay interest rates of almost 18 percent for used cars in Vermont (www.myfico.com).[12]

In its mission to loan to the traditionally underserved, the VDCU uses flexible underwriting standards (*i.e.* acceptance of non-traditional references from employers and landlords, higher debt ratios, and lower cash reserves) and provides services that mitigate short and long-term risk (*i.e.* credit counseling and financial training). Borrowers with late payments often receive personal phone calls from loan officers (rather than impersonal letters). If late payments persist, loan officers will schedule appointments to discuss viable strategies for repayment, rather than immediate repossession of vehicles.

Discussions with VDCU officers and Working Wheels clients suggest that relationship lending and investments in social capital are important aspects of the lending and credit-building process. In the next section, we develop an empirical strategy to test whether the strength of the applicant's relationship with the VDCU has a significant impact on the likelihood of receiving a Working Wheels loan. Moreover, by treating applicants with and without a credit score separately in the estimation, we test whether the relationship with the bank and other socioeconomic characteristics of the applicant have a greater impact on those for whom credit score is missing. In other words, we test if social capital can overcome the information asymmetries associated with the limited credit histories of low-income clients.

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[12] Nationwide, Eloan.com reports that individuals with a poor credit history can expect to pay interest rates between 15.95 percent to 20.95 percent for a used car valued at $17,000 (notably higher than the value of the typical Working Wheels car).

III. The empirical strategy and the data

A. Empirical strategy

As detailed in the above discussion of the mission and history of the VDCU, the objective function of a Working Wheels loan officer is clearly different from that of a traditional financial institution. Whereas a mainstream, for-profit bank is simply trying to maximize profits from current and future loans, the VDCU is trying to maximize profits from current and future loans *provided to selected low-income borrowers*. While the VDCU must remain profitable in order to continue its operations, the objective function of the VDCU contains an additional argument that incorporates some measure of the 'utility of the poor'. In other words, the VDCU includes in its objective function some measure of the benefits that accrue to the individual (and ultimately society) when low-income applicants are approved (*i.e.* increased wages, economic self-sufficiency, access to better jobs, training and child care, credit-building and financial education).

The difference in these objective functions implies that a Working Wheels officer will, in equilibrium, approve a greater number of loans to more low-income residents than will a traditional loan officer. As noted above, the challenge for the Working Wheels officer is to collect enough observable data from each applicant in order to judge their creditworthiness. Given the limited credit experiences of many low-income applicants, the VDCU must rely more heavily on other applicant characteristics in the loan approval process.

We model this process as follows. To determine loan allocation for a randomly selected applicant i at time t, loan officers at the VDCU collect and analyze four types of information. First, they collect all publicly available financial information (F_{it}) for each

applicant that could affect their ability to earn income and the likelihood that they will repay their loan obligation. This information, which includes credit score (when available), income, debt-to-income ratio, and bankruptcy history, is the same financial information that is usually requested in a loan application at a more traditional financial institution. Second, they collect personal information (P_{it}) that could affect their creditworthiness, including age and gender. Third, a loan officer may also draw conclusions about the applicant's creditworthiness based on data that measure the nature of the applicant's established social capital with the VDCU prior to this loan application. This includes the number of months that the individual has been a VDCU member at the time of application (M_{it}) and the applicant's previous loan history in the Working Wheels program (H_{it}). Both the months of membership and the previous application history are proxies for the strength of the relationship between the borrower and lender. Fourth, a loan officer at the VDCU may also draw conclusions about the applicant's creditworthiness based on data which measures the nature of the applicant's established social capital elsewhere (S_{it}). This may include the ability of the applicant to engage a co-signer and the social agency from which the applicant was referred. As the loan officer completes the application process, it stands to reason that they are more likely to rely on the second, third and fourth types of information when less of the first type of information is available.

To estimate this underlying decision, begin by letting $W_{it}*$ be a latent random variable for applicant *i* which is some measure of the individual's creditworthiness at time *t*. Assume that $W_{it}*$ is a linear function of a set of non-stochastic independent variables and an error term. These covariates include (as discussed above) vectors of

financial (F_{it}) and personal (P_{it}) information; the length of the applicant's VDCU membership at the time of application (M_{it}) and the applicant's previous loan history with the VDCU (H_{it}); and proxies for the applicant's established social capital elsewhere (S_{it}).

This decision process can be estimated as follows:

$$(1) \qquad W_{it}* = \beta_0 + F_{it}\beta_1 + P_{ij}\beta_2 + M_{it}\beta_3 + H_{ij}\beta_4 + S_{it}\beta_5 + \varepsilon_{it},$$

where ε_{it} is iid $\sim N(0,1)$.

In fact, $W_{it}*$, a measure of the individual's perceived creditworthiness, is not recorded. Only the application decision is observed. Let $A_{ij} = 1$ if $W_{it}*$ exceeds a certain amount W^a and the application is approved, and let $A_{ij} = 0$ if $W_{it}*$ is less than W^a and the application is not approved:

$$(2) \qquad A_{it} = \begin{bmatrix} 1 \ if \ W_{it}^* > W^a \\ 0 \ if \ W_{it}^* \leq W^a \end{bmatrix}.$$

Under these conditions, Probit analysis is appropriate for estimating (1)

B. The data

Formal estimation of (1) requires data on the application decision (A_{ij}), financial (F_{it}) and personal (P_{it}) information, the length of the applicant's VDCU membership at the time of application (M_{it}), the applicant's previous loan history with the VDCU (H_{it}) and a vector of other observed characteristics (S_{it}).

Table 1 provides the summary statistics of the available data. The first column lists means and standard deviations of the entire sample; the second and third columns list the same statistics for the approved and non-approved sub-samples, respectively. The variables are defined as follows:

Table 1: Characteristics of Working Wheels loan applicants			
	Total sample (n=609)	Qualified (n=249)	Not qualified (n=360)
Qualified for WW loan	0.409	1.00	0.00
	(0.492)	0.00	0.00
FICO score (n=262)	580.3	603.7	558.3
	(65.0)	(60.6)	(61.4)
Has no FICO score	0.57	0.49	0.62
	(0.50)	(0.50)	(0.49)
Income (n=589)	728	953	576
	(735)	(826)	(624)
Debt to income (n=408)	35.1	28.2	40.9
	(23.5)	(12.3)	(28.7)
Has no debt to income	0.33	0.25	0.38
	(0.47)	(0.43)	(0.49)
Bankruptcy	0.056	0.040	0.067
	(0.230)	(0.197)	(0.250)
Age	36.5	37.6	35.8
	(12.1)	(12.5)	(11.7)
Female	0.75	0.77	0.74
	(0.43)	(0.42)	(0.44)
Months in VDCU (n=505)	5.5	8.1	3.2
	(8.6)	(10.3)	(6.1)
Previous Application	0.23	0.37	0.13
	(0.42)	(0.48)	(0.34)
Previous results (n=142)	0.51	0.53	0.47
	(0.44)	(0.44)	(0.44)
Coapplicant	0.13	0.16	0.11
	(0.33)	(0.36)	(0.31)
Last five loans	0.41	0.43	0.39
	(0.24)	(0.23)	(0.25)
Notes: Summary statistics for applicants to the Working Wheels program. See the text for description of all variables			

- 'Qualified for loan' is a discrete variable that indicates whether the application was approved for a Working Wheels loan. The mean approval rate among the 609 applications in the entire sample is 40.9 percent.[13]

- 'Credit score' is the applicant's reported credit rating. The mean for the entire sample is 580.3. This breaks down to 603.7 among qualified applicants, and 558.3 among the non-qualified. As noted above, only 262 of all applicants (57 percent of the entire sample) have any recorded credit score. The remaining applicants had no credit score as a result of an insufficient credit record, so that the VDCU had no access to any standardized, industry-wide measure. 'Has no credit score' indicates that 49 percent of the qualified applicants did not have a credit score, as opposed to 62 percent of the unqualified applicants.

- 'Income' is the reliable, stable monthly income of the applicant. The mean among the 589 applicants in the sample with a properly reported income[14] is $728/month: as one would expect, the qualified applicants have a much higher mean monthly income ($953) than the unqualified ($576). It is notable that 58 of the 249 qualified applicants report no reliable, stable monthly income (a clear sign that the VDCU is extending loans to a traditionally 'high risk' and 'unlendable' population).

- 'Debt to income' (measured in percentages) is the debt to income ratio calculated by the Working Wheels loan officer. For 201 applicants, this could

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[13] As discussed in the text, many individuals may have submitted more than one application over the course of the program. However, different applications from the same individual are not identical as many credit determining variables change over time.

[14] For 20 of the applicants in our sample, income was not properly recorded in the applicant's files.

not be calculated: in most cases (188 out of 201), this was because the applicant reported no reliable, stable income. Accordingly, 'has no debt to income' is a dummy variable, which indicates that the 'debt to income' could not be calculated.

- 'Bankruptcy' indicates that the applicant has a declared bankruptcy on record. Four percent of qualified applicants had declared bankruptcy, as opposed to 6.7 percent of the non-qualified applicants.

- 'Age' and 'female' are self-described demographic variables. The mean applicant age is 36.5 years, and 75 percent of all applicants are female.

- 'Previous application' indicates that the applicant had previously applied for a Working Wheels loan. Qualified applicants (0.37) are almost three times as likely to have previously applied for a loan as unqualified applicants (0.13). 'Previous results' indicates, for the 142 previous applicants, the previous approval rate.[15]

- 'Co-applicant' indicates that the applicant had a co-signer. Thirteen percent of all applicants had a co-signer: 16 percent of qualified applications, and 11 percent of unqualified applications.

- 'Months in VDCU' indicates the number of months that the applicant has been a member of the VDCU. (Membership, which requires a $5 initiation fee and a $5 deposit to open an account, entitles the client to services like budget and credit counseling and newsletters with money management tips.)

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[15] The variable takes on the value '1' if a single previous application was approved, and '0' if it was not approved. If the applicant has had more than one previous application, the average approval rate is used: for example, if there were 2 previous applications with only one approval, the variable takes on the value '0.5'.

Qualified applicants (8.1) have been VDCU members for over twice as long as unqualified applicants (3.2).

In addition, dummy variables for each applicant's referral agency are integrated into the model.[16]

Three possible sources of bias related to these data deserve mention. First, it is possible that the loan officer's assessment of creditworthiness of applicant i is affected by recent loan decisions for previous applicants (so that the dynamic optimization of social welfare involves an unintended Markoff process). We test this possibility by including in our model an additional variable, 'last five loans,' which measures the share of the previous five Working Wheels loans that were approved by the VDCU.

The second possible source of bias concerns incomplete and/or inconsistent record keeping. For example, it may be the case that a loan officer did not bother to completely fill out a loan form for a borrower that he or she recognized as an obvious denial: this might have been the case, for example, when 'income' and/or 'months in VDCU' were not recorded. In such a case, the data would not completely describe the case for denial. To the extent that observations with missing variables are dropped from estimation, we may be left with a slightly better applicant pool than we would have otherwise. Alternatively, an incomplete application may reflect an obvious approval. That is, a loan officer may not complete the loan form for a standout application, having already decided to grant the loan. The loan officer responsible for the majority of

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[16] Because of space limitations, the summary statistics for these five 'agency' dummies are not included in Table 1. The agency names, [ACRONYMS], means, and (standard deviations) are as follows: Community Action in Southwestern Vermont - Bennington and Rutland Counties [BROC], 0.40, (0.49); Central Vermont Community Action Council [CVAC], 0.23, (0.42); Champlain Valley Office of Economic Opportunity [CVOEO], 0.22, (0.41); Northeast Kingdom Community Action [NEKCA], 0.08, (0.26); and Southeastern Vermont Community Action [SEVCA], 0.08, (0.27).

applications at the VDCU indicated to us that this was an uncommon occurrence, so this type of selection bias is likely inconsequential.

The third source stems from the fact that this analysis estimates the determinants of a successful loan application for a sample of applicants, not for the general population. This is a very important distinction. As noted by Stiglitz and Weiss (1982), self-selection can drive people out of a market. That is, in some cases people may not apply for a loan on the assumption that they cannot get one. These self-rationed individuals are not included in this model and are an important excluded group to recognize. It is not possible, of course, to determine whether these self-selected individuals would or would not have been offered loans and how this would change the overall credit allocation. It is thus necessary to emphasize that for this model the population in question is strictly the population of those who submit a Working Wheels loan application.

IV. Estimating the determinants of loan approval

As noted earlier, our hypothesis is that loan officers at the VDCU, when assessing the creditworthiness of a Working Wheels applicant without a complete set of financial information, will rely more heavily on (a) personal information, (b) the nature of the applicant's established social capital with the VDCU prior to this loan application, and (c) the nature of the applicant's established social capital elsewhere. This hypothesis is based on findings in the literature that highlight the importance of personal networks and social capital to overcome information asymmetries in lending, as detailed in Section I.

Accordingly, our empirical strategy is to divide our complete sample into two sub-samples: those applicants with a credit score, and those without. A total of 609

observations were available from the Working Wheels program. We eliminated the 124

observations for which 'income' and/or 'months in VDCU' were not recorded. We then

replace the missing values in 'debt to income' and 'previous application' with zeros:

including these modified variables with the dummy variables 'has no debt to income' and

'previous application,' respectively, leads to unbiased estimates of the model (Greene

1997). Accordingly, we are able to estimate the model for the 234 observations that

include 'credit score' and 251 observations that do not include 'credit score.'

Table 2: The determinants of qualification for a Working Wheels loan				
	(1)	(2)	(3)	(4)
	FICO sample	Non-FICO sample	FICO sample	Non-FICO sample
FICO score	0.00377 **	-	0.00379 **	-
	(0.0008)		(0.0008)	
Income	0.00021 **	0.00033 **	0.00021 **	0.00033 **
	(0.00006)	(0.00011)	(0.00006)	(0.00011)
Debt to income	-0.0071 **	-0.0067 **	-0.0071 **	-0.0066 **
	(0.0021)	(0.0019)	(0.0021)	(0.0019)
Has no debt to income	-0.18	0.20	-0.18	0.20
	(0.13)	(0.15)	(0.13)	(0.15)
Bankruptcy	-0.031	-0.339 **	-0.066	-0.346 **
	(0.170)	(0.077)	(0.177)	(0.076)
Age	-0.0016	0.0062 *	-0.0016	0.0064 *
	(0.0034)	(0.0032)	(0.0034)	(0.0032)
Female	0.016	0.153	0.021	0.155
	(0.093)	(0.080)	(0.093)	(0.080)
Months in VDCU	0.0078	0.0223 *	0.0099	0.0238 *
	(0.0050)	(0.0095)	(0.0055)	(0.0103)
Previous Application	0.13	0.25 *	0.20	0.28 *
	(0.10)	(0.11)	(0.12)	(0.12)
Previous results	-	-	-0.19	-0.12
			(0.17)	(0.20)
Coapplicant	-0.092	-0.007	-0.093	-0.002
	(0.116)	(0.125)	(0.117)	(0.125)
CVAC	-0.25 *	0.04	-0.27 *	0.04
	(0.09)	(0.09)	(0.09)	(0.09)
CVOEO	0.02	-0.20 *	0.01	-0.20 *
	(0.09)	(0.08)	(0.10)	(0.08)
NEKCA	0.27	0.22	0.27	0.23
	(0.15)	(0.12)	(0.16)	(0.12)
SEVCA	-0.15	0.03	-0.16	0.02
	(0.14)	(0.15)	(0.13)	(0.15)
Last five loans	0.076	0.185	0.078	0.179
	(0.166)	(0.148)	(0.166)	(0.148)
Adjusted r-squared	0.28	0.23	0.28	0.23

Notes: Dependent variable is 'qualified for loan.' Probit estimation is given with Huber
-adjusted standard errors in parentheses. Estimates are marginal changes in probability.
** denotes significant at less than 0.01; and * denotes 0.05.
See text for description of all variables and the two sub-samples.

Table 2 presents the results of estimating the model for these two sub-samples. Model (1) shows that, when the loan officer has access to a complete set of financial information (including the credit score), the determinants of receiving a loan are almost exclusively financial. 'Credit score,' 'income,' and 'debt to income' are all highly significant (with p-values less than 0.01.) Using statistics presented in Table 1, a one standard deviation improvement in each of these regressors leads to the following changes in the probability of receiving a Working Wheels loan: 'Credit score' (0.24), 'income' (0.15), and 'debt to income' (0.17).[17] *Ceteris paribus*, a Working Wheels applicant who made each of these three improvements in their financial status would increase their probability of receiving a loan by 0.56.

The only other significant variable in model (1) is the dummy variable for the CVAC: *ceteris paribus*, applicants with credit scores who are referred by this social agency have a 0.25 lower probability of receiving a Working Wheels loan than those referred by BROC (the omitted dummy variable of the five referral agencies, as detailed in footnote 15). We speculate that this is related to the perceived social capital of applicants located in Bennington and Rutland Counties relative to that of applicants from central Vermont, but we have no additional evidence to verify this.

It is important to note that 'months in VDCU' and 'previous application' are insignificant in the sample of applicants with credit scores. In other words, with full

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[17] These changes in probability (comparable to beta coefficients in a standard OLS model) are calculated by multiplying the standard deviations in Table 1 for 'credit score, 'income,' and debt to income' times the respective marginal probabilities. For example, 0.24 = 65.0 * 0.00377. The sign of the figure for 'debt to income' is negative since an improvement in this financial indicator is associated with a lower value.

information about an applicant's credit history, his or her relationship with the bank has no significant impact on the bank's decision to grant a loan.

Model (2) shows that, when the loan officer does not have access to a complete set of financial information, the determinants of loan approval include both financial and non-financial characteristics of the applicant. First, both 'income' and 'debt to income' are again highly significant: a one standard deviation improvement in each of these regressors leads to a 0.25 and 0.16 increase, respectively, in the probability of receiving a Working Wheels loan. But unlike in model (1), 'bankruptcy' is also highly significant: if an applicant does not have a recorded credit score, the prior declaration of bankruptcy reduces the probability of receiving a loan by 0.34. Since one's credit score accounts for prior bankruptcies, it is not surprising that inclusion of the bankruptcy variable has no marginal impact on applicants with an available credit score. When credit score is not available however, evidence of a prior bankruptcy significantly reduces the likelihood that the bank will approve the loan request.

In addition, when the critical credit information is not available, age is significant (the p-value is 0.053): an additional ten years of age increases the probability of receiving a Working Wheels loan by 0.06. The significance of 'age' in Column (2) substantiates the notion that 'age' reflects one's public reputation (*i.e.* Berger and Udell (1995), Cole (1998); Chakravarty and Scott (1999)) and may be relied upon to reduce information asymmetries associated with limited credit history.

Lastly the results in Column (2) confirm our hypothesis that one's relationship with the lender can overcome information asymmetries associated with limited credit history. Both 'months in VDCU' and 'previous application' are positive and significant

determinants of loan approval. *Ceteris paribus*, a previous applicant without a credit score but with six months of membership will increase their probability of receiving a car loan by 0.38 compared to a first-time applicant without a credit score who has just joined the credit union. This finding is in marked contrast to the results in Column (1), which suggest that prior relationship with the bank has no significant impact on loan approval once credit score is known.

Model (2) provides mixed evidence about whether the applicant's perceived social capital elsewhere affects the probability of receiving a Working Wheels loan when credit history is unknown. 'Co-applicant' is not a statistically significant determinant. The dummy variables for CVOEO and NEKCA are statistically different than that for BROC.[18] As with the previous sample, however, we speculate that this is related to the perceived social capital of applicants located in the Champlain Valley and the Northeast Kingdom relative to that of applicants from central Vermont.

Models (3) and (4) add 'previous results' to the regressors in the previous set of models. In neither case does the success or failure of the previous loan applications affect the overall estimation of the model. In the case of model (4), this provides further evidence that it is the *establishment of a relationship with a client* that is a critical determinant of qualifying for a loan, not *the outcome of the previous loan(s)*.

In summary, credit score and other financial characteristics are clear determinants of loan approval. However, when credit histories are unknown (as is often the case with

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[18] An F-test on the significance level of all of the agency dummies has a p-value of 0.001 in the case of model (1) and 0.013 for model (2). We also tested the significance of town-level means of income, poverty levels, and unemployment rates (not reported here), as well as a variable which measured the results of the last five loans from applicants in the current applicant's referring agency (similar in construction to 'last five', as described above). None of these was significant in our estimation of the model. Overall, we believe that a fruitful area for future work will be to develop better measures of an applicant's social capital elsewhere.

low-income populations), other socioeconomic factors become important determinants of loan approval. Of primary interest is the impact of the applicant's relationship with the bank on the probability of receiving credit. Our results suggest that relationship lending significantly matters for applicants without a documented credit history.

Clearly, the VDCU relies on its relationship with the applicant and other socioeconomic characteristics to try to overcome information asymmetries. One obvious question is whether the bank is making good decisions: are the approved applicants who did not have documented credit histories more likely to default than those who did? The next section answers that question.

V. Delinquency rates in the Working Wheels program

Some level of delinquency is inevitable in any lending program. Even strict risk assessment and screening procedures are not perfect. Especially when, as in the case of the Working Wheels program, applicant populations become "riskier" by industry standards, this system imperfection must be accepted (Stiglitz and Weiss, 1981).

Nevertheless, the possibility of excessive delinquency among the VDCU's Working Wheels clients is obviously a concern. Based on the determinants of loan approval detailed above, this section considers whether the non-credit sample is any more likely to default on their loans than the credit sample.

Table 4 provides summary statistics for all completed loans in the VDCU portfolio. Of the 249 applicants who have received Working Wheels loans, the mean loan amount is $2581, at a mean interest rate of 10 percent, with a mean monthly payment of $111. As shown in the first and second rows of Table 3, successful

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applicants with credit scores receive statistically higher loan amounts, and thus have

statistically higher monthly payments.[19]

Table 3: Loan results for qualified Working Wheels applicants				
	All	FICO score	No FICO score	Test of equality (p-values)
	N=249	N=127	N=122	
Loan amount	$ 2,581	$ 2,936	$ 2,211	0.00
Payment	$ 111	$ 120	$ 112	0.00
Interest rate	10.0%	10.2%	9.9%	0.28
Number of delinquent clients	44	19	25	0.25
Average delinquency (in days)	57.2	62.7	53.0	0.66
Delinquent for more than 30 days	0.09	0.10	0.08	0.58
Delinquent for more than 90 days	0.04	0.06	0.02	0.22
Income	$ 1,141	$ 1,540	$ 725	0.00
Number with no reliable income	59	8	51	0.00
Notes: summary statistics for qualified loan applicants				
All test of equality are t-tests, except for 'number of delinquent clients'				
and 'number with no reliable income' which are Pearson Chi-squared tests				

As shown in the third row, a total of 44 clients to date have been delinquent at

some point: the mean length of delinquency has been 57 days. As shown in the fourth

and fifth rows, 9 and 4 percent of clients have been delinquent for more than 30 and 90

days, respectively.

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[19] One might consider the possibility of running a Tobit regression with the same regressors as in Table 2, where the actual loan amount – truncated at 0 – would proxy for some underlying evaluation of creditworthiness. In fact, the loan amount is predetermined as the application is completed: it is not likely to be lower or higher if the client is considered less or more creditworthy. This also suggest that requested loan amount itself could be a regressor in the model estimated in the previous section. We tried this, and it did not affect the probability of receiving a loan or any of the other results reported here.

The disaggregated results for the two samples show that the loan recipients without credit score were no more likely to be delinquent than the loan recipients with a credit score. In fact, in the case of rows 3 - 5, the mean for the credit score sample is higher (non-statistically) than for the non-credit sample.

Of course, it is still possible that the high-payment clients among the non-credit score sample are more likely to be delinquent: in this case, the means reported above would mask this fact. To test this possibility, we constructed a variable that reflects the average amount of the loan outstanding, which is the product of the days delinquent and the average daily loan payment.[20] We can easily reject the null, at a p- value of 0.39, that this variable is different across the samples. In fact, as in the other measures of delinquency, the mean value for the credit score clients ($287) is greater than that of the non-credit score clients ($203).

Finally, Table 4 shows the results of probit models that test whether the 'no credit score' cohort is any more likely to be delinquent on their loan repayments than the 'credit score' cohort. Our empirical strategy here is to pool the data from both cohorts, assign the mean value of 'credit score' to all clients without a credit core, and include a 'has no credit score' dummy for these clients (which, again, leads to unbiased estimates (Greene 1997)).[21] By pooling the data in this way, we are able to compare the relative effects of having a low or high credit score with having no credit score at all.

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[20] That is, the monthly loan payment divided by 30.
[21] We also checked that similar models which treat each cohort separately lead to results that are consistent with those we report here: a higher credit score lowers the probability of being in default, and no other regressor significantly predicts default. The only exception is in the case of the credit score sample, where we find that women have a 0.38 higher likelihood of being in default (a result for which we have no ready explanation). If we include an interactive term -- between 'female' and 'has no credit score' – in specification (1) of Table 4, we still arrive at similar conclusions about the relative effects of being in each cohort.

As dependent variables, we use the indicators which show that the client has been delinquent for at least one day (specification 1) or for at least 30 days (specification 2). As independent variables, we use most of the same regressors as in our model of the determinants of loan approval[22]: this allows us to test whether any of the information that is available at the time of the loan decision predicts the likelihood of default among applicants who do receive a loan. We also include 'length of loan' (measured in months), which indicates the length of the loan at the time we collected the data on these clients. (If the loan is paid off, 'length of loan' will be the same as the loan maturity.)

First, the results in model (1) of Table 4 indicate that higher credit scores are associated with a lower probability of ever having been in default. A standard deviation increase in the credit score -- 65 points -- lowers the probability of ever having been in default by 0.27. Even among the approved applicants, credit score is a good predictor of the likelihood of ever being in default. Second, the <u>negative</u> and significant coefficient on 'has no credit score' implies that, *ceteris paribus*, a client without a credit score is 0.17 <u>less</u> likely to be in default than a client with the mean credit score. In fact, measured this way, such a client is a better credit risk than three of four 'credit score' clients.[23] Model (2) illustrates that only 'length of loan' is a significant determinant of delinquency of over 30 days. Neither the 'credit score' or 'no credit score' sample is a significant predictor in this model.

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[22] We omit 'bankruptcy' and NEKCA, since they perfectly predict default in the case of the second specification. We also omit 'last five loans', since it is unlikely that the previous decisions by the loan officer among five other applicants would affect the default rate of any given approved applicant.

[23] In this model, not having a credit score is equivalent to having a credit score of 620, which is just below the 75th percentile among the 'credit score' cohort.

Table 4: The determinants of loan delinquency among Working Wheels borrowers		
	(1)	(2)
	Delinquent at	Delinquent at
Dependent variable	least one day	least 30 days
Estimation technique	Probit	Probit
Length of loan	0.0024	0.0047 **
	(0.0034)	(0.0017)
Credit score	-0.0043 **	-0.0004
	(0.0008)	(0.0003)
Has no credit score	-0.17 **	-0.03
	(0.88)	(0.04)
Income	0.000004	0.000011
	(0.000080)	(0.000022)
Debt to income	-0.0009	0.0007
	(0.0033)	(0.0015)
Has no debt to income	0.090	0.054
	(0.171)	(0.064)
Age	-0.0006	-0.0016
	(0.0031)	(0.0013)
Female	0.067	-0.018
	(0.085)	(0.042)
Months in VDCU	0.0022	0.0015
	(0.0052)	(0.0020)
Previous Application	0.053	0.043
	(0.088)	(0.044)
Coapplicant	0.046	-0.024
	(0.101)	(0.059)
CVAC	-0.023	-0.052
	(0.092)	(0.049)
CVOEO	-0.058	-0.037
	(0.091)	(0.043)
SEVCA	0.305	0.034
	(0.228)	(0.060)
Constant	2.71	-0.03
	(0.49)	(0.20)
Adjusted r-squared	0.18	0.08

Notes: See text for descriptions of all variables. Probit estimation with Huber -adjusted standard errors in parentheses. Estimates are marginal changes in probability.

Overall, the data from current Working Wheels clients reveal that the non-credit score applicants who receive loans are no more likely to be delinquent than the credit score applicants who receive these loans. In fact, they are less likely to have ever been in

default[24] – even though (as shown in the last two rows of Table 3) the mean income for the qualified non-credit score loan recipients is only $725 (fifty percent of the mean income for the credit score sub-sample), and 51 of the 59 loan recipients with no steady, reliable income are in the non-credit score sub-sample.

VI. Private Benefits of Working Wheels

> *"I was in real trouble and didn't know what to do. I didn't even bother with the regular banks because I knew they would reject me…who is going to bother with me? And the local dealers all knew that I didn't have much money so they were all going to sock me for interest…"*
>
> **-***Interview with Working Wheels client*

> *"At the point that I first walked into the credit union, I really couldn't afford a loan, but they (VDCU) were willing to work with me and make it work anyway. They were very good to work with, I think because they were willing to do what I wanted and could do – not what was best for them or what they wanted. It is such a good program and it enabled me to keep going back to work- to get there every day and keep my job. It also helped me build my credit back up. I actually ended up getting a second loan through them as well, which was easier than the first, way faster. They were really good to work with, it was a really positive experience, no negative anything - everything was all good."*
>
> *-Interview with a Working Wheels client*

The empirical evidence presented in this paper suggests that the 'Working Wheels' loan process is fulfilling the VDCU mission: successfully targeting 'unlendable' clients though a loan process that builds social capital between lender and borrower. This section assesses the private returns to clients of this process.

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[24] We speculate – without being able to empirically test – that this is because such clients are being very careful about building a credit rating -- and their established social capital with the loan officer has paid off, in terms of observing their loan commitment.

Many of the private benefits of Working Wheels are difficult to quantify. Qualitative evidence collected during interviews with 15 randomly-selected Working Wheels clients suggest that the program has had substantial net benefits: for many clients, it has eased the transition from welfare to self-sufficiency, improved job prospects and child care options, and taught many financially naïve clients how to build credit and manage money more efficiently.

What about the quantifiable benefits? Among those approved clients for whom the only source of auto credit is the VDCU, a significant quantifiable benefit of car ownership is the increase in wages and employment associated with access to a car. While our numerous interviews with Working Wheels clients suggest that both income and employment increased with access to credit, our data do not allow us to calculate the increase. However, other studies have tried to estimate the marginal impact of car ownership on wages. Using data from the National Longitudinal Survey of Youth, Holzer et al. (1994) find that car ownership is associated with an increase in wages of 11 percent. A study by Ways to Work, a national program that provides car loans to low-income families, suggests that car ownership is associated with a 20 percent increase in wages among welfare recipients (reported in Goldberg, 2001).

Our data do allow us to calculate another quantifiable private benefit of this program: the interest saved on VDCU loans among approved clients who had another source of auto credit -- predatory used-car lenders. According to Fair, Isaac and Company, the average annual interest rate in Vermont for a used car for a borrower with a poor credit history is approximately 18 percent. For many Working Wheels clients, the

next best alternative to this program is borrowing from a predatory lender that charges from 18 to 20 percent (the legal interest limit on used car loans in Vermont).

Accordingly, for each of the clients in our data set who received a Working Wheels loan, we have estimated the interest saved per borrower. This is first calculated as difference between (a) the total interest paid on the client's VDCU loan and (b) the total interest that would have been paid on the same loan at 18 percent (assuming the same loan amount and monthly payment but a longer term). For the 225 qualified loans for which we had full information on loan amount, monthly payment and interest rate, the total interest savings from the program was almost $123,000. The total principle of all Working Wheels loans is $642,600, so that each dollar in a Working Wheels loan saved low-income Vermonters $0.19 in interest. Since the average loan size is $2580, this represents an average savings of $490.

Calculated as difference between (a) the total interest paid on the client's VDCU loan and (b) the total interest that would have been paid at 20 percent, then the 225 Working Wheels clients saved a total of $165,000 in interest. Under this scenario, each dollar in a Working Wheels loan saved low-income Vermonters $0.26 in interest – an average savings of $700.

VI. Conclusion

This paper has introduced one solution to the transportation barrier faced by poor people in rural areas: the Working Wheels program at the Vermont Development Credit Union. By providing small car loans to those who would otherwise have difficulty

qualifying for affordable credit, the Working Wheels program has made the "to" in Welfare-to-Work possible for over two hundred low-income Vermonters.

Using the complete set of data from this program, we find that the strength of the relationship between creditor and higher risk borrowers significantly raises the probability of loan approval – and that the borrowers who receive these loans are relatively creditworthy. Specifically, for applicants without credit scores, we find that -- in addition to standard financial criteria such as income and debt ratio -- age and the nature of the established relationship with the lender significantly influence the probability of loan approval. By contrast, for applicants with credit scores, only income, debt ratio and the credit score are significant determinants of loan approval. In addition, despite the greater information asymmetry associated with applicants whose credit histories are unknown, we find relatively lower delinquency rates among the approved applicants without credit scores compared to those with credit scores.

In the current climate of welfare reform, we conclude that policymakers should consider programs that encourage welfare recipients to establish relationships with traditional financial institutions and establish more programs like Working Wheels that facilitate access to affordable credit for automobiles. Specifically, we believe that investing in the social capital between borrower and high-risk lender is likely, in many circumstances, to have a high payoff to credit institutions whose objective function includes the welfare of their clients. These investments include providing services that increase interaction and establish trust between lender and borrower (for example, credit counseling and financial training) and encouraging applicants to resubmit loan applications as their financial outlook begins to improve.

As we noted above, discussions with VDCU officers and Working Wheels clients suggest that relationship lending and investments in social capital are important aspects of their program. The results presented here suggest that establishing a commitment to each other, through a continued membership with the VDCU and repeated loan applications, has had a high return to lender and borrower alike.

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