Overcoming Information Asymmetries in Low-Income Lending: Lessons from the 'Working Wheels' Program*

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Abstract: Without access to transportation, the welfare-to-work transition is nearly impossible, yet little is known about the effectiveness of programs designed to improve credit access. Since 1998, Vermont's TANF funds have provided automobile loans through the "Working Wheels" program. We use micro-level data from this program to explore how to cost-effectively provide loans to clients who can not obtain affordable loans elsewhere. Our results verify the importance of relationship lending, particularly among those without documented credit histories. In the presence of information asymmetries about credit history, our results justify the increased trust placed in clients with whom the bank has a stronger relationship; such clients, *ceteris paribus*, are less likely to default. We conclude that in the current climate of welfare reform, policymakers should consider programs that encourage welfare recipients to establish and maintain relationships with financial institutions in order to facilitate access to credit and minimize the risk of default.

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

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1. Introduction

"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 toward welfare-to-work policies. 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, self-sufficiency and the transition off welfare (Cervero, Sandival, and Landis 2003; Danziger *et al*. 1999; Goldberg 2001; Ong 2002). 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.* 1999; Holzer, Ihlanfeldt and Sjoquist 1994; Ong 1996, 2002; O'Regan and Quigley 1997; Polit and O'Hara 1989; Raphael and Rice 2002). The Raphael and Rice (2002) and Ong (2002) studies are particularly important as they both account for the dual causality of employment and car ownership and still find a strong effect of car ownership on labor supply. Another recent study by Lucas and Nicholson (2003) finds that vehicle acquisition through a car 'donation-and-sales' program in Vermont has significant positive effects on both the level of earned income and the probability of paid employment. Yet despite the proven benefits of car ownership, Murakami and Young (1997) find that 36 percent

of low-income, single parents have no vehicle, compared to only four percent of middle and upper income households.

Access to a car is particularly important in rural and selected suburban areas where public transportation, car-pooling, and other ride share opportunities are not well established.[1] 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. Even those with enough income or savings to purchase a car, still face high registration, insurance and maintenance costs; Reichart (1998) estimates that a family earning minimum wage may spend as much as 14 percent of its income on annual car ownership costs (excluding purchase price and major repairs).

It is clear that 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 mandates that often require transportation. In some states, recipients of "Temporary Assistance for Needy Families" (TANF) who cannot secure mandated employment or job training are penalized through either partial or total loss of welfare benefits (Goldberg 2001).

Many states and counties, recognizing the importance of access to transportation in the welfare-to-work transition, use TANF and state maintenance of effort (MOE) funds to assist low-income families purchase, insure or repair cars. For example, Kansas, Nebraska, Pennsylvania and Florida provide grants directly to low income families for car purchases; California, Virginia and Ohio donate or resell government surplus vehicles; and Arizona, Georgia, Vermont, Maine,

Michigan, New York, Tennessee and Wisconsin fund programs that provide affordable car loans (Goldberg 2001; National Economic Development and Law Center 2004; Reichert 1998).

Since 1998, Vermont's TANF funds have been used to provide automobile loans to low-income residents through the "Working Wheels" program of the Vermont Development Credit Union (VDCU), a non-profit credit union that caters to traditionally 'unlendable' clients. Very little is known about how welfare-to-work programs such as Working Wheels improve the access to credit for traditionally disenfranchised individuals. In this paper, we take advantage of unique micro-level data on Working Wheels loan applications and loan performance to explore how such programs can cost-effectively provide car loans to those who are unable to obtain affordable loans elsewhere (particularly low-income clients without documented credit histories). Specifically, by stratifying a large sample of Working Wheels loan applications by the presence of a credit score, we first test the hypothesis that a strong lender/borrower relationship ('relationship lending') can overcome the information asymmetry that would otherwise impede the flow of credit to those who are perceived as 'unlendable'. We then examine whether relationship lending can mitigate the risk of loan default among this high-risk population.

Our results verify the importance of relationship lending, particularly among those without documented credit histories. In the presence of pronounced information asymmetries about credit history, our results justify a loan officer's increased trust in a client with whom the bank has had a stronger relationship; such clients, *ceteris paribus*, are less likely to default. We conclude that in the current climate of welfare reform, policymakers should consider programs that encourage welfare recipients to establish and maintain relationships with financial institutions in order to facilitate access to affordable credit and to minimize the risk of loan default.

The remainder of this paper is organized as follows. Section II provides a brief background and overview of the related literature while Section III provides more detailed information on the VDCU and the Working Wheels program. Section IV outlines our empirical strategy and describes the data. Section V presents the empirical results and Section VI concludes.

2. Background and Literature Review

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, thereby potentially increasing the probability of borrower default and 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 dollar lent falls. Not surprisingly, many poor households report an inability to secure an affordable car loan through traditional financial institutions, particularly since these institutions are often legally prohibited from raising interest rates above state-established ceilings. 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]

Low-income households face costly consequences of this form of credit rationing. Those who are denied credit by mainstream financial institutions are often forced to rely on payday lending, title loans, rent-to-own, pawn-broking and tax refund anticipation loans with typical

annualized interest rates over 100 percent (but often as high as 500 percent) and stiff pre-payment penalties (Caskey 2002; Barr 2004). Reliance on this largely unregulated alternative financial sector not only undermines the financial stability of the poor, but also imposes negative externalities on the rest of society (Barr 2004).

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 bureau scores as a tool to overcome many of the informational asymmetries in the credit market.[3] 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 (Ferrary 2003).

Relatively little is known about the role of relationship lending in the consumer loan market[5], despite the fact that household borrowing constitutes a larger fraction of the overall loan market than business loans.[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. Using the same data, Chakravarty and Yilmazer (2004) find that

the relationship between the borrower and lender affects the borrower's decision to apply for a loan and the lender's approval/rejection decision but does not have a significant impact on the loan rate. Again, since low-income borrowers -- and particularly welfare recipients -- have little opportunity to establish strong banking relationships or invest in their own social capital[7] with lenders, they are more likely to be rationed out of the credit market.[8]

Not surprisingly social capital, relationship lending and the establishment of trust through repeated interactions between lender and client are also key components of successful microcredit programs in the developing world. Microcredit programs typically lend small amounts of money (as little as $75), without collateral, to poor would-be entrepreneurs that have been excluded by the formal banking sector. In order to overcome information asymmetries associated with lending to poor, disenfranchised clients, microcredit programs rely upon both group-lending contracts (where jointly liable group members use social capital to screen out bad risks and monitor loan repayment) and progressive lending (where loan size is increased as the borrower-lender relationship is strengthened) (Murdoch 1999; Sriram 2002).

The literature is surprisingly silent on the impact of banking relationships on the probability of loan default. While numerous studies have examined the determinants of loan performance (e.g. Ang, Chua, and Bowling 1979; Boyes, Hoffman, and Low 1989; Jacobson and Roszbach 2003; Han 2004; Lawrence, Smith and Rhoades 1992; Martin and Hill 2000; Weagley 1988), no study (of which we are aware) includes a proxy for the strength of the client-lender relationships in their analysis. Two studies by Elasas and Krahnen (1998; 2000) find that banks offer greater loan flexibility and financial support when firms with which they have strong (self-reported) relationship face economic distress; this suggests that relationship lending is likely to be negatively associated with loan default. The microfinance literature has found that

relationship lending through peer group contracts has successfully reduced the probability of default (see Murdoch 1999 for a broad overview); for example, using data from FINCA-Peru, Karlan (2004) finds that individuals with stronger social ties to their peer lending group (measured by geographic proximity or cultural similarity) have lower probabilities of default. To the extent that relationship lending (whether between borrower and lender or between jointly liable peers) improves monitoring and enforcement of repayment, this also suggests that default rates are likely to be lower among borrowers with stronger ties to the bank. Again, however, none of these studies directly test the hypothesis that consumers with a strong lender client-relationship are less likely to default on their loans. The present study attempts to close this gap in knowledge.

This paper also extends the literature in other important ways. First, access to micro-level data on Working Wheels loans allows us the unique opportunity to analyze credit rationing and loan performance among the high-risk, low income population in the United States. Second, to our knowledge, no other study explores the possibility that relationship lending can mitigate the information asymmetries and perceived risk of this traditionally 'unlendable' population. Third, while the literature on the loan process in the business and mortgage markets is extensive, much less is known about the role that relationship lending plays in the allocation and performance of consumer loans. Fourth, rather than relying on firm/household financial surveys or hypothetical loan applications (as is common in the literature), we use loan applications and thus focus on the information used in actual credit decisions.

3. 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 mission of the VDCU, a non-profit credit union founded in 1989, 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, provides automobile loans to low-income residents of Vermont, who (reflecting the state's demographic characteristics) are primarily non-Hispanic white.[9] 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.[10] Nearly all Working Wheels clients are referred to the VDCU by one of the five Community Action Agencies (CAAs): Community Action in Southwestern Vermont (Bennington and Rutland Counties); Central Vermont Community Action Council; Champlain Valley Office of Economic Opportunity ; Northeast Kingdom Community Action; and Southeastern Vermont Community Action. These are a diverse set of community-based social agencies, located throughout the state, that help low-income households find access to no-cost or low-cost services, including emergency health care and financial support. The staffs of these CAAS refer their clients to the VDCU when the clients need help in gaining access to

financial services. 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 (U.S. Census Bureau 2001).[11] 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 distribution of credit scores of the Working Wheels applicants to the U.S. population[12], highlights the perceived risk of Working Wheels applicants.

<Figure 1 about here>

As of June 2002, the VDCU had financed almost 300 car loans totaling $685,220. Loans ranged in size from $75-$10,700, and the average loan was $2580. Working Wheels loans are typically applied to used car purchases, although a small number of loans finance car repairs. In general, the interest rate is 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, 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).[13]

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 form letters. If late payments persist, loan officers will schedule appointments to discuss viable strategies for repayment, rather than rely on immediate repossession of vehicles (Richardson 2003).

Discussions with VDCU loan officers and Working Wheels clients suggest that relationship lending is an important aspect of the lending and credit-building process. For example, membership, which requires a $5 initiation fee and a $5 deposit to open an account, entitles the client to free services like budget and credit counseling and newsletters with money management tips. Members whose loan applications are initially rejected are encouraged to reapply and are often given detailed "Action Plans" designed to improve creditworthiness.

In the next section, we develop an empirical strategy to test whether an applicant's relationship with the VDCU has a significant impact on loan approval and loan default. By treating applicants with and without a credit score separately in the estimation, we test whether the lender/client relationship has a greater impact on those for whom credit score is missing. In other words, we test whether relationship lending can overcome the information asymmetries associated with the limited credit histories of low-income clients.

4. The Empirical Strategy and the Data

Empirical Strategy

As suggested by the discussion of the mission and history of the VDCU in the previous section, the objective function of a Working Wheels loan officer differs from that of a traditional financial institution. The objective of a traditional bank is to maximize profits from current and future loans. While the VDCU does seek profits in order to expand its operations, the objective function of the VDCU is to provide access to capital to lower-income individuals so that they can

improve their well-being through higher wages, access to better jobs, and training and childcare. At the VCDU, helping clients with credit-building and financial education is also a critical part of their mission.

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 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 loan approval process as follows. To determine loan allocation for a randomly selected applicant, loan officers at the VDCU collect and analyze three types of information. First, they collect all publicly available financial information that could affect one's ability to earn income and to repay the loan. This information, which includes 'credit score' (when available), 'income', 'debt-to-income ratio', and 'bankruptcy history', is the same financial information requested in a loan application at a more traditional financial institution. Second, they collect personal information that could affect creditworthiness, including 'age', 'gender' and 'presence of a coapplicant'. Third, a loan officer may also draw conclusions about the applicant's creditworthiness based on data that measure the strength of the applicant's prior relationship with the VDCU. As we detail in the next section, we use two different measures -- the 'number of months' that the individual has been a VDCU member at the time of application, and the applicant's 'previous loan history' in the Working Wheels program -- as proxies for the strength of the relationship between the borrower and lender. As loan officers complete the

application process, it stands to reason that they are more likely to rely on personal information and relationship strength when financial information is limited.

Since banks rely on personal, financial and relationship information to assess a client's creditworthiness when approving a loan, it is likely that these same determinants will influence the probability that a client defaults on a loan. Presumably, clients with better financial resources and fewer financial obligations are less likely to default, as are those with stronger relationships with the VDCU. We additionally expect that the loan terms, as measured by 'loan amount' and 'length of loan' (loan duration measured in months), may potentially affect the likelihood of default.

To illustrate our empirical strategy, assume that we have the following loan approval and loan default equations (where x_1 and x_2 represent vectors of financial, personal and relationship information):

$$(1) \quad y_1 = x_1'\beta_1 + \varepsilon_{1,} \qquad y_1 = \begin{cases} 1 \text{ if loan approved} \\ 0 \text{ if not} \end{cases}$$

$$(2) \quad y_2 = x_2'\beta_2 + \varepsilon_{2,} \qquad y_2 = \begin{cases} 1 \text{ if loan defaulted} \\ 0 \text{ if not} \end{cases}$$

Since default is only observed for applicants who are approved for loans (i.e. y_2 is only observed when $y_1=1$), we must account for the possibility that sample selection may bias our estimates of the probability of default (Heckman 1979). Sample selection bias becomes problematic if there exists some correlation among the errors, ε_1 and ε_2 in equations 1 and 2. For example, if we assume that $(\varepsilon_1,\varepsilon_2) \sim$ bivariate normal $(0, 0, 1, \sigma_\varepsilon, \rho)$ then ρ is a measure of the correlation among the errors. The correlation between the two errors will be negative if the unobserved determinant increases the probability of loan approval but decreases the probability

of default, while it will be positive if the unobserved tendency to approve the loan is also associated with a greater probability of default. If correction is not made, then the estimates of the coefficients in the default equation will be biased and inconsistent.

Accordingly, the appropriate econometric technique is the bivariate probit with sample selection.[14] It corrects for the fact that the sample of individuals who are approved for loans may be systematically different from those who are rejected; the model further allows us to use information from rejected applicants to obtain consistent parameter estimates of the probability of default. The log-likelihood for the bivariate probit model with sample selection is:[15]

$$Log-L=\sum_{y_1=1,y_2=1}\log\Phi_2[\beta_1'x_{i1},\beta_2'x_{i2},\rho]+\sum_{y_1=1,y_2=0}\log\Phi_2[\beta_1'x_{i1},-\beta_2'x_{i2},-\rho]-\sum_{y_1=0}\log\Phi[-\beta_1'x_{i1}]$$

Data

Table 1 provides the summary statistics of the available data, which covers all the Working Wheels loans made between April 1999 and May 2002. The first column lists means and standard deviations of the entire sample while the second and third columns distinguish between those with and without credit scores. The visible differences in the two sub-samples justify the separate treatment of those with and without credit scores in the empirical analysis of loan approval and loan default. [16]

<Table 1 about here>

'Approved for loan' is a discrete variable that indicates whether the application was approved for a Working Wheels loan.[17] The mean approval rate among the 609 applications in the entire sample is 40.9 percent. Notably, the approval rate is higher for those with documented credit histories (50 percent) compared to those without credit histories (34 percent) and this difference is statistically significant ($p<.001$).

Financial Characteristics

'Credit score' is the primary applicant's reported credit rating. Only 268 of all 'Working Wheels' applicants (44 percent of the entire sample) had any recorded credit score; the remaining applicants had an insufficient credit record so that the VDCU could not obtain a standardized credit rating. The mean credit score for this sub-sample is 579.7.

'Monthly Income' is the reliable, stable monthly income of the applicant. 402 applicants in the sample report a stable income from full- or part-time employment or transfers from family members or other sources.[18] This sub-sample has a mean income of $1293/month: the applicants with credit scores have a much higher mean monthly income ($1435) than those without credit scores ($1098) and this difference is statistically significant ($p<.001$). It is notable that 12 applicants without both a credit score and reliable, stable monthly incomes were granted Working Wheels loans, a clear sign that the VDCU is extending loans to a traditionally 'high risk' and 'unlendable' population.

'No steady income' is a dummy variable for the other sub-sample that report no reliable, stable income. Applicants without credit scores are significantly more likely ($p<.001$) to have no such income than applicants with documented credit histories (50 percent compared to 12 percent), further highlighting the perceived risk of this population. 'Debt to income' is the debt to income ratio calculated by the Working Wheels loan officer for the sub-sample of applicants with a steady mean income: this could not of course be calculated for all applicants without steady incomes (and for a handful of other applicants for whom the data was unavailable).

'Bankruptcy' indicates that the applicant has a declared bankruptcy on record. While seven percent of applicants with credit scores had declared bankruptcy as opposed to 4 percent of applicants without credit scores, this difference is not statistically significant.

Personal Characteristics and Relationship Lending.

'Age' and 'female' are self-described demographic variables. The mean applicant age is 36.5 years, and 75 percent of all applicants are female. The 3 year difference in mean age between applicants with and without credit scores is significant ($p<.05$), but the gender composition of the two sub-samples does not differ in any statistically significant way.

'Months in VDCU', the number of months that the applicant has been a member of the VDCU at the time of application, is used as one of two measures of the strength of the lender/client relationship: the length of one's relationship with the bank is the standard proxy for the strength of this relationship in the banking literature (e.g. Berger and Udell 1995; Cole 1998; Chakravarty and Scott 1999; Chakravarty and Yilmazer 2004).

How good is 'Months in VDCU' as measure of the strength of the lender/client relationship? Among Working Wheels applicants, there is a strong positive correlation between 'months in VDCU' and the loan officer's indication of a positive history with the bank (r=.56), which suggests that membership duration indeed measures more than just 'time served'.[19] In addition, our interviews with clients indicate that ongoing membership services (e.g., budget and credit counseling) establish a strong working relationship between client and lender. One might also be concerned that longer relationships, however, could be correlated with personal characteristics, including client stability. Among Working Wheels applicants, we find that there is no correlation between 'months in VDCU' and two different measures of client stability: the loan officer's assessments of job history (r=-.06) and stable residency (r=.08).

'Previous application', an indicator that the applicant had previously applied for a Working Wheels loan, is also used as a measure of the client/lender relationship. (The high correlation (r=.64) between 'months in VDCU' and 'previous application' preclude their

inclusion in the same model but suggest that both are alternative proxies for the extent of one's relationship with the VDCU.)

Table 1 suggests that those with credit scores have been VDCU members for more than twice as long as those without credit scores (7.5 and 2.8 months, respectively) and this difference is statistically significant ($p<.001$). To the extent that those without documented credit histories are more likely to be credit-rationed and less likely to have established ties to the financial community, this result is not surprising. Furthermore, as Figure 1 indicates, many applicants with credit scores have abysmally low credit scores (almost 40% have scores below 550); this suggests that applicants with low credit scores may require credit counseling and other financial services offered by the VDCU prior to preparing and submitting their application. Furthermore, applicants with credit scores (and stronger ties to the financial community) are almost three times as likely to have previously applied for a Working Wheels loan as applicants without credit scores (0.37 and 0.13, respectively).

Other Potential Determinants.

'Co-applicant' indicates that the applicant had a co-signer. Thirteen percent of all applicants had a co-signer: 18 percent of those with credit scores and 9 percent of those without credit scores. In addition, dummy variables for each applicant's referral CAA are included as potential determinants of loan approval.[20] The referral agencies are omitted from our estimates of loan default (thereby serving as identifiers in the selection equation) since the identity of the loan referral agency should not affect the probability of default of any given *approved* applicant many months later.

Three possible sources of bias 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. We test this hypothesis by including in our loan approval model an additional variable, 'last five loans,' which measures the share of the previous five Working Wheels loans that were approved by the VDCU. Again, 'last five loans' is omitted in the default model since the outcome of the previous five loan decisions should not affect the probability of default of any given *approved* applicant many months later.

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 'monthly income' was 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 applications at the VDCU indicated that applications are filled out completely for every potential applicant, eliminating the concern for either type of selection bias.

The third source of potential bias stems from the fact that this analysis estimates the determinants of loan approval and loan default for a sample of applicants (some of whom were referred by a CAA), not for the general population. This is a very important distinction. As noted by Stiglitz and Weiss (1981), 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. Indeed, Chakravarty and Yilmazer (2004) have shown that a borrower's decision to apply for a bank loan is partially determined by the strength of their relationship with the bank. These self-rationed

individuals are not included in this analysis 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 or loan performance. It is thus necessary to emphasize that for this analysis the population in question is strictly the population of those who submit a Working Wheels loan application, and the results that we report below are generalizable only to those who might apply for a loan in the first place.

5. Results

In this section, we first report the estimated determinants of loan approval among all Working Wheels applicants, and then report the estimated determinants of loan default among Working Wheels applicants who received a loan.

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 personal information and the nature of the applicant's established relationship with the VDCU prior to this loan application. Accordingly, our empirical strategy is to divide our complete sample into two sub-samples: those applicants with a credit score (n=266), and those without (n=339). Table 2 presents the determinants of loan approval for each sub-sample, using each of the available measures of the strength of relationship between the creditor and the borrower ('Months in VDCU' and 'Previous Application')[21].

<Table 2 about here>

The marginal effects reported in columns (1) and (2) verify that many of the covariates behave as expected; they also highlight the differences in the determinants of loan approval between the two sub-samples, particularly when 'Months in VDCU' is used as the measure of

the strength of relationship. Among those with a documented credit history (Column (1)), we find that 'credit score' is a major determinant of loan qualification. Specifically, a one standard deviation improvement in 'credit score' increases the probability of qualifying for a loan by 0.23.[22] Measured this way, 'credit score' is one of the strongest predictors of loan approval. Of course, this is not a surprising result: 'credit score' is believed to be one of the most heavily relied upon indicators of creditworthiness in the loan process. Column 1 also shows that 'credit score' applicants with a co-applicant decreased their probability of receiving a loan by 0.26. This is quite consistent with the notion that weaker applicants often find co-applicants to strengthen their application: accordingly, the presence of a co-applicant ('co-applicant' = 1) may signal that the main applicant is a relatively weak candidate. The significant negative coefficient is an indicator that unobserved aspects of the candidate's weaknesses are affecting the final loan decision.[23]

Columns (1) and (2) also indicate that 'income' and 'debt to income' are significant determinants of loan approval in both sub-samples, as expected. A one standard deviation increase in monthly 'income' increases the probability of receiving a Working Wheels loan by 0.17 for those with credit scores and 0.24 for those without credit scores, all else constant. A one standard deviation reduction in the applicant's 'debt to income' ratio increases the probability of loan approval by 0.18 for credit score applicants and 0.14 for applicants without credit scores. These two financial characteristics, which are not incorporated into credit scores, are important in the loan approval process, regardless of the availability of information about credit history. By contrast, 'bankruptcy' is a significant (negative) determinant in the 'no credit score' sample only. Since one's credit score reflects 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, the prior declaration of bankruptcy reduces the probability of receiving a loan by 0.22, *ceteris paribus*. Based on the results presented above, this has the same impact as reducing 'credit score' by one standard deviation in the first sample. A history of bankruptcy, we conclude, is a crude proxy for a lower credit score in the absence of a documented credit history.

Notably, the impact of personal characteristics differs between the two samples. Age and gender of the applicant are only significant determinants of loan approval when the VDCU loan officer does not have access to credit score information. In column (2), 'age' is positive and significant (the p-value on 'age' in column 2 is 0.06): all else constant, an additional ten years of age increases the probability of receiving a Working Wheels loan by 0.048.[24] The significance of 'age' among this sub-sample is consistent with the notion that 'age' reflects one's public reputation (*e.g.* Berger and Udell 1995; Cole 1998; Chakravarty and Scott 1999) and may be relied upon to reduce information asymmetries associated with limited credit history. In addition, when credit score is unavailable, females appear to have a significant advantage in the Working Wheels loan process: all else constant, when the primary applicant is female, the probability of receiving a loan is 0.16 higher than when the primary applicant is male.[25]

The important role of relationship lending in reducing information asymmetries is highlighted in columns (1) and (2). While column (1) suggests that the duration of the banking relationship has no significant impact on loan approval for applicants with credit scores, column (2) indicates that duration has a relatively large and statistically significant impact on loan approval for applicants without credit scores. Specifically, the coefficients on 'Months in VDCU' and 'Months in VDCU (squared)' in column (2) show that each additional month of membership significantly increases the probability of receiving a loan, at a slightly decreasing

rate. [26] We see this as a confirmation of the hypothesis that the lender/borrower relationship plays a larger role in mitigating information asymmetries for clients without credit histories.

Figure 2 illustrates the change in the loan approval probability for the 'no credit score' sample as a function of the length of VDCU membership. *Ceteris paribus*, an increase in the length of VDCU membership from two months to six months is associated with a 0.23 increase in the probability of receiving a loan – the same increase as a one standard deviation improvement in 'credit score' for an applicant who has a recorded credit history, as discussed above. The results in column (1) suggest that a similar increase in VDCU membership would have no measurable impact on loan approval among those with documented credit histories.

<Figure 2 about here>

The final two columns in Table 2 use 'previous application' as the measure of strength of relationship between lender and client.[27] In these two models, the results on all of the financial and personal characteristics are the same as in the two models discussed above, but the results on relationship lending differ. Column (3) indicates that relationship lending is a significant determinant among the 'credit score' sample: a previous loan application increases the probability of receiving a loan by 0.24.[28] Column (4) indicates that the comparable figure for the 'no credit score sample' is 0.39. Together, these results suggest that relationship lending is critical for both sub-samples of 'Working Wheels' applicants, and that the magnitude of the effect is larger for the sub-sample without a documented credit history.[29]

The results in this sub-section can be summarized as follows. When credit histories are known, credit score and other financial characteristics are strong determinants of loan approval for the credit score sample. In addition, a previous application to the VDCU increases the probability of receiving a loan among this subset of 'Working Wheels' applicants. When credit

histories are unknown (as is often the case with low-income populations), loan officers are using as many other signals as possible, including demographic ones: all known financial characteristics, personal characteristics, and the lender/client relationship are all important determinants of loan approval. Compared to a 22-year-old male with two months VDCU membership, an otherwise identical 32-year-old female with six months membership has a 44 percent higher probability of qualifying for a Working Wheels loan. And among this subset as well, a previous application to the VDCU increases the probability of receiving a loan.

At the VDCU, relationship lending, age and gender increase the probability of receiving access to credit for an applicant without a documented credit history. But are such clients creditworthy? The next sub-section asks whether approved applicants without documented credit histories are more likely to default than approved applicants with credit scores; and then tests for differences in the determinants of loan default across the two sub-samples.

The determinants of loan default

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

Nevertheless, the possibility of excessive default among the VDCU's Working Wheels clients is obviously a concern. The process of monitoring loans that are delinquent for more than 30 days is time intensive; when a loan is in default, the VDCU is lucky to recover half of the value of the loan through a public auction of the repossessed car (Richardson 2003). Based on the determinants of loan approval detailed above, this sub-section considers whether the non-credit score sample is any more likely to default on their loans than the credit score sample, and

whether the financial, personal and relational characteristics that affect loan qualification are good predictors of loan default.

Table 3 provides summary statistics for all completed loans in the VDCU portfolio for which loan performance records are available. Unfortunately, complete records on loan performance for the earliest (60) Working Wheels loans were purged when a new data system was installed, eighteen months prior to our data collection. Statistical analysis of the personal, financial and relational characteristics suggests that there is no systematic difference between the purged, earlier applicants and the later applicants for which default information is available. Thus exclusion of these purged records should not introduce selection bias in our default model results. Of the 175 applicants who received Working Wheels loans (and whose loan performance is known), the mean loan amount is $2494, at a mean interest rate of 10.1 percent, with a mean monthly payment of $109. As shown in the first and second rows of Table 3, successful applicants with credit scores receive higher loan amounts, and thus have higher monthly payments (although this difference is not statistically significant). Interestingly, the interest rate is statistically higher (at the 0.10 level) for credit score applicants (third row), despite the fact that they are less likely to default on their loans.

<Table 3 about here>

Most importantly, Table 3 shows that 25 percent of the approved clients without a credit score defaulted on their car loans, as opposed to 13 percent among clients with a credit score. These summary statistics provide strong evidence that qualified applicants without credit scores are at a much higher risk for default.

This high rate of default is obviously a great concern to the staff of the VDCU. In the rest of this sub-section, we test empirically whether any of the financial, personal and relational

characteristics that affect loan qualification are good predictors of loan default and furthermore, whether the marginal effects of these characteristics differ for the credit score and non-credit score sub-samples.

Table 4 presents the results of estimation of default probability for the two sub-samples. For the credit sample, the correlation between the error terms in the selection equation 1 and the default equation 3 is not significant, so standard probit yields unbiased estimates (columns 1 and 3). The lack of correlation in the error terms suggests that there are no omitted variables that jointly determine loan approval and loan default. For the non-credit sample, this correlation is significant, so columns (2) and (4) report the results from the default component of the bivariate probit (with sample selection)[30, 31]. This difference is perhaps not surprising; the potential unobservable factors that might impact both the loan approval and loan default decisions (e.g. motivation, perceived financial responsibility, familial support network) are likely reflected in the applicant's credit history. Thus once credit score is known, there is no need to control for potential selection bias. However, for the sample without a credit score, the same unobserved characteristics that determine loan approval are likely to determine loan default but will not be reflected in any included covariates.[32]

<Table 4 about here>

The results in the first two columns of Table 4, which use 'months in VDCU' as the measure of the strength of the lender-client relationship, indicate that the determinants of loan default differ between the two subsamples. For the credit score sub-sample, 'credit score' is the only financial characteristic that is a significant determinant of default, and the magnitude of the effect is relatively small: a one standard deviation (64.6) decrease in 'credit score' increases the

probability of default by 0.04. Neither 'income' nor 'debt to income' significantly determines default.

By contrast, income is a significant and large predictor of default among the non-credit score sample. Increasing monthly income by one standard deviation ($935 among the sub-sample highlighted in Table 3) lowers the probability of default by 0.19. Debt to income is not significant in this sub-sample either.[33] This result indicates that for these higher risk applicants, a relatively low monthly income, as opposed to a relatively high debt to income ratio, is a very significant predictor of the likelihood of default.

However, lending to clients with established credit scores is placed at risk by terms of the loan itself. As presented in the last rows of column (1), clients in this sub-sample are more likely to default as the loan amount increases and the length of the loan decreases.[34] These results indicate that even for this more 'lendable' cohort, the loan is riskier when the client has higher payments that must be repaid in less time. A one standard-deviation ($1937) increase in the loan amount increases the probability of default by 0.06, and one standard-deviation (25.2 months) decrease in the length of the loan increases the default probability by 0.14. These more 'lendable' clients are still vulnerable to default when the terms of a loan are relatively demanding. By contrast, loan terms do not affect the default probability of the non-credit sample. We speculate that this is because the VDCU loan officer may set loan terms for this higher risk sample more carefully.

Selected measures of personal characteristics and relationship lending are marginally significant in each of the two sub-samples. An increase of one standard-deviation (12.1 years of age) lowers the probability of default by 0.04 for the credit sample, and 0.08 for the non-credit sample (the p-value for the 'age' coefficient in column 2 is 0.12). As noted above, age has been

identified as a signal of one's public reputation (Berger and Udell 1995; Cole 1998; Chakravarty and Scott 1999). Likewise, a female client in the non-credit sample has a 0.16 lower probability of default (the p-value for the 'female' coefficient in column 2 is 0.13). This result, and the doubling of the magnitude of coefficient on age for the non-credit score sample (0.08 compared to 0.04), is consistent with the notion that selected personal characteristics are more important signals when credit information is missing. Age and gender of the client, which are relied upon by the loan officer to reduce information asymmetries when credit information is unavailable, are indeed good indicators of financial creditworthiness.

The important role of the lender-client relationship as an indicator of creditworthiness is highlighted in Table 4. For the credit sample, the results in column (1) show that a one-standard deviation increase in 'Months in VDCU' (8.2 months) decreases the probability of default by 0.02. For the riskier non-credit sample, the comparable figure is 0.17.[35] This relatively large difference in the change in probabilities (0.15) is about the same as the difference between the average default rate for the 'credit score' and the 'no credit score' sample (0.14). In sum, a six-month increase in VDCU membership will, *ceteris paribus*, equate the risk of default of the 'no credit score' sample with the 'credit score' sample.

The next set of results in Table 4 use the alternative measure of the strength of relationship: in columns 3 and 4, 'previous application' significantly reduces the probability of default in both subsamples, but the magnitude is notably higher among the 'no credit score' sample (-0.24 compared to –0.09).[36] The results further suggest that age and gender of the client are particularly good indicators of financial creditworthiness when credit scores are not known: in column 4, the p-values for these regressors are 0.03 and 0.06, respectively.

Overall, the results reported in Table 4 are consistent with the hypothesis that the lender/borrower relationship can successfully play a much larger role in mitigating information asymmetries for clients without credit histories. We believe that the results from this entire section tell a compelling two-part story about overcoming information asymmetries among the riskiest low-income clients. First, for approved clients without credit scores, four of the six[37] significant predictors of receiving a loan -- income, age, gender, and a measure of the strength of the lender/borrower relationship -- are also significant predictors of the likelihood of default.[38] Second, the magnitude of the effect of the strength of the lender/borrower relationship is much greater than the comparable magnitude among clients with credit histories.

These results are telling – and important – in two ways. First, income, age and gender (the financial and personal characteristics that were used in the approval process as signals of whom to trust), are indeed good measures of creditworthiness. *Ceteris paribus*, VDCU loan officers are indeed minimizing the risk of default among non-credit applicants by providing loans to relatively older women with higher incomes. Second, the analysis suggests that trust in low-income clients is increased with a stronger borrower-client relationship, and that such clients are increasingly creditworthy. Building a stronger working relationship between client and borrower allows the lender to overcome some of the information asymmetry associated with not having access to a credit score.[39]

Indeed, the decreased probability of loan default is likely to be based on several different aspects of the lender/borrower relationship. First, as the length of membership increases and/or the applicant reapplies for a loan, the applicant will be receiving more of a financial education and will thus have learned how to be more financially responsible. Second, as the bank loan officer becomes more familiar with the applicant, s/he will be better able to tailor the length and

amount of the loan to the applicant's needs. Third, as the loan recipient becomes more familiar with the bank officer, s/he will be more comfortable in approaching the officer in the event of difficulty in making loan payments.

While the results reported here do not allow us to untangle which of these aspects is most important, we believe that this empirical evidence is consistent with a client-oriented policy agenda for TANF programs in the consumer loan market. By investing in 'relationship lending' among its most marginalized clients (through the kinds of one-to-one interactions in the Working Wheels program that we detailed in Section III) financial institutions will significantly reduce the probability of default in its portfolio. We recognize that this may at times entails a tradeoff: the literature cited above (and the experience of so many Working Wheels clients that we interviewed) illustrates the urgency of getting an automobile into the hands of the working poor. What our results suggest, however, is that that urgency must be balanced by the strengthening of the relationship between the lender and the client.

6. Conclusion

> *"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

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, we estimate that each successful VDCU client who would otherwise have turned to a predatory lender has an average interest savings of $700 per year. And of course, they gain substantial benefits from establishing a regular credit history and, most importantly, from securing a stable job.

Using the complete set of data from the Working Wheels program, we find that when credit histories are unknown (as is often the case with low-income populations), the lender/client relationship becomes a particularly important determinant of loan approval. Additionally, for approved clients without credit scores, the lender/client relationship is a significant and relatively large predictor of the likelihood of default. Despite the rural and non-multiethnic nature of Vermont, we believe that these results have general applications for the rest of the United States: trust in low-income clients is increased with a stronger borrower-client relationship, and such clients are increasingly creditworthy.[40] Building a working relationship between client and borrower allows the lender to overcome some of the information asymmetry associated with not having access to a credit score.

In the current climate of welfare reform, low income households face many challenges in trying to obtain and maintain auto ownership. Indeed, access to auto loans may not help those low-income clients who can not afford the share of the purchase price not covered by the auto loan, or who cannot afford the necessary payments or other expenses associated with car ownership. Establishing a strong relationship between client and borrower is certainly not the only solution that is required to facilitate low-income auto ownership.

Nevertheless, we conclude from this research that policymakers should carefully evaluate the welfare-to-work strategies of programs that facilitate access to affordable credit for automobiles, particularly in low-income neighborhoods. Policymakers should support programs that encourage welfare recipients to establish and maintain long-term relationships with the lending institution, and to take advantage of financial counseling and services. Auto loan programs that invest in the social capital between borrower and high-risk lender are likely 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.

Our many discussions with VDCU officers and Working Wheels clients suggest that relationship lending and investments in social capital are important aspects of their program. The empirical 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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[1] Even in urban areas, public transportation may be limited during the "off-hours" often associated with low-wage shift work.

[2] 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.

[3] Credit scoring relies on quantitative measures of past loan performance and outstanding debt to predict future credit risk. For example, Fair Isaac Corporation generates credit scores based on

payment history (35 percent of score); amounts owed (30 percent); length of credit history (15 percent); new credit requests (10 percent) and types of credit in use (10 percent) (www.myfico.com).

[4] Estimates suggest that between 4 million and 19 million Americans over the age of 18 have no credit score. In particular, immigrants, the elderly and the poor are less likely to have credit scores (Lewis 2001).

[5] By contrast, several studies have shown that a firm's relationship with the lender is likely to have a positive effect on credit availability and loan terms for the firm (Berger and Udell 1995; Cole 1998; Blackwell and Winters 1997; Siles, Hanson and Robison 1994).

[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 U.S.).

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

[8] A 2000 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).

[9] Race and ethnicity data on the applicants were not available.

[10] The VDCU also has low-income lending programs for housing and small business development.

[11] Seventy six percent of Working Wheels applicants have household incomes less than half of this amount.

[12] The Working Wheels data come from the 268 applicants who had an available credit score, as further discussed below. The mean credit score for this sample is 580, and the standard deviation is 65. The source for the U.S. data in Figure 1 is www.myfico.com.

[13] 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).

[14] See Greene (2003) for a textbook description of the model and Boyes, Hoffman and Low (1989) for an early application of the model to loan approval and default.

[15] Note the Φ_2 represents the cumulative bivariate normal distribution.

[16] 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. In the probit estimates that follow, the standard errors are corrected for non-independence of repeat applications.

[17] Only a small number of applicants apply for loans for car repairs, so we do not test for differences in outcomes between the 'car purchase' and 'car repair' sub-samples.

[18] The stability of these income sources is verified, through pay stubs and other supporting documents, by the VDCU loan officer. We do not have detailed information about variation in monthly income.

[19] The files indicated whether the loan officer felt that the applicant had a positive history with the VDCU. The endogeneity of this assessment precluded its use in the empirical modeling but its high correlation with membership duration suggests that 'months in VDCU' is a good proxy for the strength of the lender/client relationship.

[20] Because of space limitations, the summary statistics for these five CAA 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).

[21] We ran a Chow test with the pooled sample to verify that the coefficients across the sub-samples are statistically different (with a p-value of less than 0.00).

[22] This is calculated as the product of 64.63 (the standard deviation of 'credit score', as reported in Table 1) and 0.00351 (the marginal effect on 'credit score' in column (1) of Table 2.)

[23] Two of the CAA dummy variables – CVAC and NEKCA – are also significant determinants of the probability of receiving a loan in the 'credit score' sample (as is CVOEO among the 'no credit score' sample.) We have no specific explanation for why candidates from different referral agencies are perceived to be more qualified. We did verify that the other results in the model do not change by rerunning this model without these CAA dummies. Using applicant zip codes and geographical data, we also verified that residential location and proximity to the VDCU did not affect our results.

[24] We verified that the effect is linear, not quadratic, by testing alternative models with age and 'age squared' and with the natural log of 'age'.

[25] Using gender to evaluate credit worthiness would be a violation of the Equal Opportunity Act: we do not suggest that the VDCU is doing this. Rather, it is likely that certain personal indices

such as gender are correlated with other latent characteristics related to credit worthiness. For example, Quercia, McCarthy and Stegman. *(*1995) suggest that among rural, low-income borrowers, female single heads of household are less likely to default on home mortgages than male single heads of household.

[26] Note Norton, Wang and Ai (2004) highlight the difficulty in interpreting higher order coefficients in a probit specification.

[27] In a previous draft of the paper, we included both 'months in VDCU' and 'previous application' as regressors in a single model (in which case, 'previous application' is not significant in either subsample). But, as noted above, we have treated them separately in this draft because they are highly correlated. We thank several seminar participants and readers for this suggestion.

[28] A dummy variable indicating whether the applicant's prior loan was approved was also tested and found to be insignificant in both samples.

[29] By pooling the data across these two sub-samples, we found that this difference is not statistically significant, with a p-value of 0.19.

[30] The Heckman probit selection procedure is a maximum likelihood procedure that does not use a two-step method (unlike the Heckman selection procedure when the dependent variable is continuous), so an inverse Mills Ratio is not computed and put into the main equation. A Wald Test of independent equations (rho = 0) has a p value of 0.95 and 0.93 in the case of the credit sample (columns 1 and 3), and 0.00 and 0.02 for the non-credit sample (columns 2 and 4).

[31] We do not report the results of the selection equation for the non-credit sample, since they are similar to those reported in Table 2 for the larger sample of clients for whom full information

was available. (Recall that default information was purged from the VDCU's records for the first 60 loans).

[32] Notably, Ross (2000) also finds that the covariance between approval and default declined considerably once credit history was included in the analysis.

[33] We did not include the bankruptcy variable in this sub-sample, because only three of the approved non-credit clients had ever declared bankruptcy, and the inclusion of this variable meant that convergence could not be achieved for the estimation of the default model with sample selection.

[34] We find similar results (with a p-level of 0.11) if we replace 'monthly payment' for 'loan amount' in this model.

[35] In a previous draft of the paper, we reported the results of this model including 'Months in VDCU (squared).' Subsequent tests of the robustness of this model revealed that, when this quadratic term is eliminated, there is a small but statistically significant linear effect of 'Months in VDCU' on default probability among the credit score sample, as we report in this revised draft.

[36] Because of the difference in estimation procedures for these two models, we cannot accurately test for the statistical significance of this difference. The 95% confidence interval for the 'credit score' coefficient is –0.01 to –0.17; the 95% confidence interval for the 'no credit score' coefficient is –0.08 to –0.41

[37] What about the other two variables? As shown in columns (2) and (4) of Table 4, 'Debt to income' is not a significant determinant in this model and we have removed 'bankruptcy' from the default model due to lack of sufficient variation, as explained above.

[38] As we noted above, the respective p-values for 'age' and 'female' are 0.12 and 0.13 in column 2, and 0.03 and 0.06 in column 4.

[39] See Ferrary (2002) for a more generalized elaboration on this point.

[40] In urban, multiethnic regions of the country, one can certainly speculate that the lenders would need to consider ways that ethnic diversity could positively or negatively affect the nature of the borrower/client relationship (for a broad discussion of the mechanisms through with ethnicity can affect outcomes, see Alesina and La Ferrara (2003).

Table 1: Characteristics of Working Wheels loan applicants

	Total sample (n=609)	Credit score (n=268)	No credit score (n=341)
Qualified for WW loan	0.41	0.50	0.34
	(0.49)	(0.50)	(0.47)
Monthly Income	1,293	1,435	1,098
	(935)	(1,094)	(605)
Debt to income	35.1	34.8	35.4
	(23.5)	(21.6)	(26.0)
No steady income	0.33	0.12	0.50
	(0.47)	(0.32)	(0.50)
Bankruptcy	0.06	0.07	0.04
	(0.23)	(0.26)	(0.21)
Age	36.5	38.0	35.4
	(12.1)	(12.7)	(11.4)
Female	0.75	0.73	0.77
	(0.43)	(0.45)	(0.42)
Months in VDCU	4.9	7.5	2.8
	(8.2)	(10.0)	(5.8)
Previous Application	0.23	0.37	0.13
	(0.42)	(0.48)	(0.34)

Coapplicant	0.13	0.18	0.09
	(0.33)	(0.39)	(0.28)

Notes: Summary statistics for applicants to the Working Wheels program. The sample is separated by existence of a credit score. The mean credit score is 579.70 (s.d. is 64.63)

Table 2: The determinants of qualification for a Working Wheels Loan

	(1) 'Credit score' sample	(2) 'No credit score' sample	(3) 'Credit score' sample	(4) 'No credit score' sample
Credit score	0.00351		0.00364	
	(0.00067)***		(0.00065)***	
Income (in $1000)	0.128	0.182	0.137	0.204
	(0.045)***	(0.076)**	(0.046)***	(0.077)***
Debt to income	-0.0077	-0.0058	-0.0081	-0.0059
	(0.0021)***	(0.0016)***	(0.0021)***	(0.0018)***
No steady income	-0.14	-0.11	-0.15	-0.10
	(0.13)	(0.10)	(0.12)	(0.11)
Bankruptcy	-0.066	-0.221	-0.084	-0.227
	(0.154)	(0.071)***	(0.131)	(0.073)***
Age	-0.0006	0.0048	0.0002	0.0055
	(0.0030)	(0.0025)*	(0.0030)	(0.0025)**
Female	0.01	0.16	-0.01	0.14
	(0.08)	(0.06)***	(0.08)	(0.06)**
Months in VDCU	0.020	0.068	-	-
	(0.013)	(0.014)***	-	-
Months in VDCU (squared)	-0.00023	-0.00144	-	-
	(0.00044)	(0.00044)***	-	-
Previous application	-	-	0.24	0.39
	-	-	(0.08)***	(0.08)***
Coapplicant	-0.26	0.05	-0.26	0.03

	(0.10)***	(0.12)	(0.10)***	(0.13)
CVAC	-0.23	-0.04	-0.22	-0.05
	(0.09)**	(0.07)	(0.09)**	(0.06)
CVOEO	0.03	-0.13	0.04	-0.15
	(0.09)	(0.07)*	(0.09)	(0.07)**
NEKCA	0.32	0.12	0.35	0.07
	(0.13)**	(0.10)	(0.12)***	(0.10)
SEVCA	-0.10	-0.07	-0.11	-0.09
	(0.14)	(0.10)	(0.13)	(0.10)
Last five loans	0.15	0.04	0.20	0.03
	(0.17)	(0.12)	(0.15)	(0.12)
Observations	266	338	266	339
Pseudo R-squared	0.27	0.21	0.26	0.16

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Notes: Dependent variable is 'qualified for loan.' Estimates are marginal changes in probability from a Probit estimation. Robust standard errors (clustered across repeat applicants) in parentheses

Table 3: Loan results for qualified Working Wheels applicants

	Full Sample (n=175)	Credit Score Sample (n=95)	No Credit Score Sample (n=80)	T Test of equality (p-values)
Loan Amount	$ 2,494	$ 2,604	$ 2,364	0.42
Length of loan (months)	25.0	26.9	22.7	0.28
Monthly Payment	$ 109.46	$ 113.24	$ 104.90	0.23
Interest Rate	10.1%	10.3%	9.8%	0.09
Defaulted on loan	18%	13%	25%	0.04
Income	$ 1,106	$ 1,424	$ 728	0.00
No steady income	25%	11%	41%	0.00

Notes: Summary Statistics for qualified applicants

Table 4: The determinants of loan default among Working Wheels borrowers								
	(1)		(2)		(3)		(4)	
	'Credit score' sample		'No credit score' sample		'Credit score' sample		'No credit score' sample	
Credit score	-0.00058		--		-0.00060		-	
	(0.00042)	*			(0.00044)	*	-	
Income (in $1000)	-0.038		-0.202		-0.031		-0.191	
	(0.027)		(0.099)	**	(0.028)		(0.093)	**
Debt to income	0.0025		-0.0034		0.0018		-0.0034	
	(0.0016)		(0.0074)		(0.0017)		(0.0046)	
No debt to income available	0.13		-0.09		0.20		-0.07	
	(0.20)		(0.16)		(0.28)		(0.15)	
Bankruptcy	0.02		--		0.14		--	
	(0.09)		--		(0.19)		--	
Age	-0.0032		-0.0064		-0.0028		-0.0075	
	(0.0017)	**	(0.0042)		(0.0019)	**	(0.0035)	**
Female	-0.024		-0.161		0.001		-0.158	
	(0.045)		(0.109)		(0.037)		(0.086)	*
Months in VDCU	-0.002		-0.021		--		--	
	(0.002)	*	(0.008)	***	--		--	
Previous application	--		--		-0.09		-0.24	
	--		--		(0.04)	**	(0.10)	**
Coapplicant	0.127		-0.140		0.117		-0.156	

	(0.157)		(0.139)		(0.157)		(0.156)	
Loan amount (in $1000)	0.034		0.015		0.031		0.010	
	(0.014)	***	(0.040)		(0.015)	**	(0.030)	
Length of loan	-0.0057		0.0035		-0.0053		0.0035	
	(0.0024)	**	(0.0059)		(0.0025)	**	(0.0050)	
Sample size (default equation)	91		77		91		77	
Pseudo R-squared	0.24		--		0.29		--	
Rho for Heckman selection test	--		-0.89		--		-0.86	
P value for Rho			(0.15)				(0.00)	

Notes: Dependent variable is 'defaulted on loan.' Estimates are marginal changes in probability from a probit estimation, with sample selection in columns (2) and (4). Robust standard errors (clustered across repeat applicants) in parentheses.
* significant at 10%; ** significant at 5%;*** significant at 1%
See text for description of all variables and the two sub-samples.

Figure 1: Distribution of Credit Scores in the U.S. and for Working Wheels

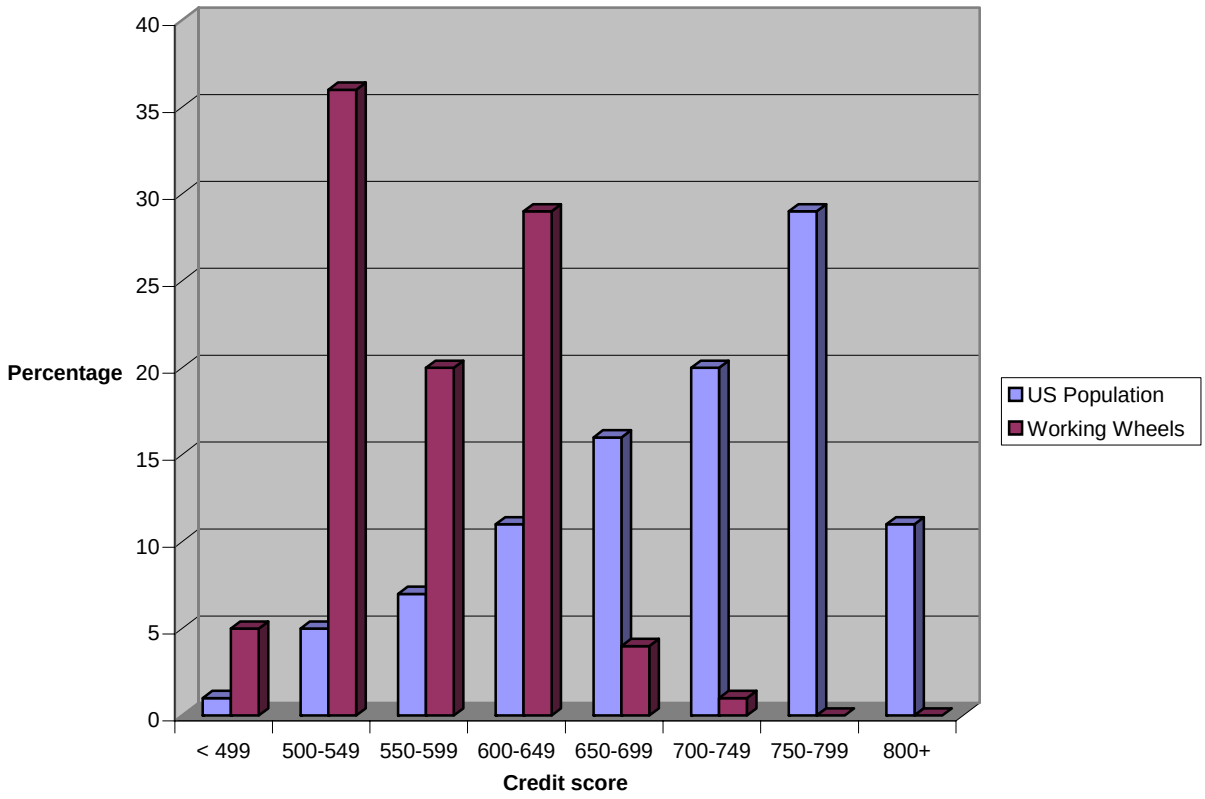

Figure 2: Change in loan approval probability for 'no credit score' sample