How Access to Credit Affects Self-Employment:

Differences by Gender during India's Rural Banking Reform

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Abstract: This study uses a pooled sample of household survey data collected by India's National Sample Survey Organization between 1983 and 2000 to examine the impact of access to credit on self-employment among men and women in rural labor households. Results indicate that access to credit encourages women's self-employment as own-account workers and employers, while it discourages men's self-employment as unpaid family workers. Additional results indicate that ownership of land, a key form of collateral, serves as one of the strongest predictors of men's and women's self-employment. There are also interesting class differences within the bottom tier of India's caste system: self-employment is less likely for members of scheduled castes, but more likely for members of scheduled tribes.

Keywords: Women, India, Asia, Self-Employment, Loans, Rural Banks

I. Introduction

Microenterprises constitute an important source of productive employment for men and women around the world. While some individuals start their own businesses as a means toward greater flexibility in generating income and new opportunities for innovation, others resort to self-employment in microenterprises as a coping strategy in the face of scarce employment opportunities. Especially in developing countries where the very poor are more constrained in their economic choices by the market environment, lack of infrastructure, and insufficient sources of affordable credit, small-scale entrepreneurship serves as one of the primary vehicles for income generation (Banerjee and Duflo 2007). In addition, women use self-employment as a means of combining employment with childcare responsibilities. Household business ventures often employ a substantial proportion of the workforce, particularly in less developed countries with large informal sectors. Understanding the conditions under which people decide to operate household enterprises can contribute to policy reforms that support self-employed individuals and promote other such entrepreneurial activities.

A key area of policy intervention is the provision of small-scale loans through microfinance and rural banks. Both have aided in reducing poverty by providing a diverse range of financial services to the poor and the disenfranchised. While the Self Employed Women's Association (SEWA) in India and the Bangladesh Rural Advancement Committee (BRAC) and Grameen Bank in Bangladesh have received an enormous amount of attention in scholarly and policy discourse, other institutions in developing countries have also experimented with a number of financial sector reforms to provide pecuniary resources to people without access to conventional loans from commercial banks. An important example is India's rural social banking program, which was initialized following the nationalization of banks in 1969. This state-led

expansion of the banking sector focused primarily on opening new bank branches in previously unbanked rural locations and was demonstrated by Burgess and Pande (2005) to have led to a statistically significant reduction in poverty in rural India.

Our objective in this research is to examine whether greater access to financial resources increased the likelihood of self-employment, and whether there were differences in effects along gender lines. Since self-employed households tend to be less poor, if greater access to finances increased self-employment probabilities, then this is one possible channel through which India's social banking program may have worked to reduce poverty. As noted in Das (2003), the extent of rural self-employment varies by social affiliation, religion, and gender. In addition, the ten-year period following bank nationalization saw a tremendous increase in the agricultural labor force, which rose by a third for women (16 to 21 million) and almost 10 percent for men (32 to 34 million) (Bennett 1992). This study conducts a detailed examination of the determinants of self-employment for men and women using combined micro-data and macro-data sources that span the years 1983 to 2000. Following the classification in the National Sample Survey Organization (NSSO) schedules, we denote the self-employed to be individuals who worked as own-account workers and unpaid family workers.

We find that India's rural banking reform program increased the likelihood of women's self-employment as own-account workers, while having little effect on men's self-employment work as own-account workers. A possible explanation is that since women have restricted access to formal employment in developing countries such as India, when the household obtains a loan, it is rational for women to become self-employed and to start a home-based business. This explanation finds resonance in the conclusions of Luke and Munshi (2007), who argue that underprivileged groups in society are much more likely to avail of new opportunities. Our

finding that the credit expansion had relatively stronger effects for women contributes to an expanding literature, but one with conflicting results, on the impact of credit on economic activity in developing countries.

Background

In India's rural areas, a substantial proportion of income is subject to crop-cycle fluctuations that result from seasonality and unexpected weather patterns. Seasonality coupled with the lack of access to formal insurance mechanisms implies that poor rural households can undergo marked fluctuations in their annual incomes. Absent sources of income that do not depend on weather outcomes, these fluctuations in income flows can not only affect household consumption patterns, but also decisions about employment. Greater access to credit through microfinance programs and rural banking facilities can improve the ability of households to withstand shocks to consumption and production (Menon 2006).

In response to this potential role for credit in the rural sector and the inadequate coverage then provided by existing formal credit and savings institutions, India's government made a concerted effort to increase the number of banks throughout rural India. In what Burgess and Pande (2005) describe as the biggest bank expansion agenda followed by the government of any country, India embarked on an aggressive program to increase opportunities for poor households in the rural sector to acquire credit and deposit savings in formal institutions. Between 1969, when the government nationalized India's commercial banks, and 1990, when the official licensing program (described in detail below) ended, approximately 30,000 new bank branches opened in previously unbanked rural locations. The program included mandates based on population and stock of branches per capita, with a particularly ambitious licensing reform in

1977 that required banks to open branches in four previously unbanked locations in order to obtain a license to open a branch in a location that already had banks.

Not only did the government encourage branch openings in unbanked rural locations, it also controlled deposit and lending policies so as to provide individuals with incentives to use the new banks. It set savings rates above those in urban areas and lending rates below those of urban areas. Additional provisions set targets on lending in priority areas that included agriculture and small-scale entrepreneurs. After the program ended in 1990, no additional bank branches were opened in unbanked rural locations (Burgess and Pande 2005). However, rural banking activity continued to grow throughout the 1990s; total bank branches, commercial bank deposits in the rural sector, and commercial bank advances in the rural sector all continued to expand (Figure 1).

The increased availability of finance described above may mitigate circumstances that tend to make women's work in self-employment less productive and profitable. For example, since much of rural female labor in India is uneducated and restricted in geographic mobility, women are likely to be self-employed in "female" trades, which tend to be small-scale and only marginally profitable (spinners, weavers, and makers of tobacco products). In this context, improved access to credit may have provided the opportunity for female workers to move up the ladder of self-employment activities and to undertake more profitable work in larger-scale operations. Although we do not have the data on profits or number of employees hired in a self-employment business to formally test this assertion, we can examine occupational patterns over time to assess the extent to which credit may have facilitated shifts to more productive and profitable work.

To this end, Figures 2 and 3 present descriptive statistics for men and women for the most common occupational categories among the self-employed with and without loans in 1983 and in 1999-2000. The most common occupation for men and women was cultivators (owners). The dominance of land cultivation as the primary occupation was particularly true for the self-employed with no loans. While men showed more variation in other leading occupational categories between 1983 and 2000, livestock farming and dairy farming consistently ranked high for women (especially women with loans). Although these descriptive results are simple correlations, they are consistent with the hypothesis that for women, credit can facilitate the move from cultivation toward more capital-intensive livestock and dairy farming. A final point of interest is the steady rise of bidi making as a leading occupation among rural self-employed women during the 1990s, especially for women with no loans. Producing these hand-rolled cigarettes is a highly labor-intensive process in an industry comprised of both factory-based and home-based enterprises. The predominance of women with no loans in bidi production is consistent with the low capital requirements in this industry.

A growing body of research has examined the effects of increased access to credit on economic activity in low-income countries, with a range of sometimes contradictory findings. For example, Pitt and Khandker (1998) found that credit given to female participants in Grameen programs had strong positive effects on both male and female labor supply. Also evaluating the effects of the Grameen bank as well as the Bangladesh Rural Advancement Committee (BRAC), Hashemi *et al*. (1996) conclude that participants mostly used the loans for small-scale self-employment in activities as diverse as rice-paddy processing, animal husbandry, and artisan crafts. These programs increased women's control over finances, raised women's economic and social standing, and boosted women's productivity in and out of the home. Other research shows

that credit and non-credit services made available by participation in BRAC and Grameen programs led to positive profits from self-employment (McKernan 2002), and that the presence of village-level microfinance groups in Thailand stimulated asset growth and occupational mobility (Kaboski and Townsend 2005).[1]

In contrast to these positive results, an experimental approach in de Mel *et al.* (2008) showed that small cash or in-kind grants given to a randomly-selected group of microenterprises in Sri Lanka resulted in high rates of return for men, on the order of about 5 percent per month, but no positive returns for female-owned enterprises. Coleman (1999) finds that several group-lending programs for women in Northeast Thailand had no statistically significant impact on a number of measures of economic activity, including production, sales, and time spent working. In a set of more nuanced results, Kevane and Wydick (2001) find that among those entrepreneurs who borrowed from a microenterprise lending institution, women entrepreneurs of child-bearing age were unsuccessful in creating employment with their businesses compared to other entrepreneurs, but there were no gender differences in business sales following credit provision. Finally, McKenzie's (2009) review of a recent set of randomization trials lends support to the argument that simply providing greater access to capital is not sufficient to help microenterprises grow. McKenzie's assessment of microenterprises and finance in developing countries concludes that additional policies designed to improve business training, provide business-development services, and facilitate shifts into more profitable sectors are likely to enhance the impact of credit on small business ventures.

Methodology and Data

Our analysis examines the probability of engaging in self-employment, conditional on a household's access to credit and a set of other personal and household characteristics. Again, the

self-employed include individuals who worked as own-account workers and unpaid family workers.[2] We alternatively use the value of a household's outstanding debt and the number of rural bank branch openings from 1983 to 2000 as measures of credit access, and specify the following reduced form equation for access to credit *C* by an individual *i* in state *j*:

$$C_{ij} = \alpha^C X_{ij} + \beta Z_{ij} + \lambda_j^C + \varepsilon_{ij}^C \quad . \qquad (1)$$

The notation X_{ij} is a vector of personal and household characteristics; Z_{ij} denotes a different set of determinants of credit access that do not directly affect the employment decision; and α^C and β are parameters to be estimated.[3] The parameter λ_j^C is an unobserved state-specific determinant of access to credit, and ε_{ij}^C is an error term that captures unobserved factors affecting credit access that varies by individual and has an expected conditional mean of zero. The vector X includes variables for education, caste, religion, whether the household owns land, whether the person is married, whether the person lives in a female-headed household, region of residence, age, number of household members (household size), and number of children of pre-school age (children aged 0-4 years).

Next, we specify the probability S_{ij} of self-employment of individual *i* in state *j* conditional on their personal and household characteristics X_{ij} and on their credit access C_{ij} as:

$$S_{ij} = \alpha^S X_{ij} + \varphi C_{ij} + \lambda_j^S + \varepsilon_{ij}^S \quad . \qquad (2)$$

As before, α^S and φ are parameters to be estimated, λ_j^S is an unobserved state-specific determinant of self-employment, and ε_{ij}^S is an error term capturing unobserved factors affecting self-employment that varies by individual and has an expected conditional mean of zero. Because the variable C_{ij} in equation (2) is endogenous (that is, there is potential correlation between λ_j^C and λ_j^S and between ε_{ij}^C and ε_{ij}^S), identification of its effect on self-employment requires that it be treated endogenously.

To estimate the model, we use a pooled sample comprised of four cross-sections of household survey data collected by the NSSO. The data include the years 1983 (38th round), 1987-1988 (43rd round), 1993-1994 (50th round), and 1999-2000 (55th round). For each round, we utilize the "Activity" file of the Employment and Unemployment module - Household Schedule 10 - which contains detailed information on individual and household socioeconomic characteristics for an average of about 643,000 individuals in each year. To construct our working sample, we retain all working-age individuals (ages 18-59) living in rural households classified as agricultural labor and other labor households. We restrict our analysis to rural labor households since information on household loan activity in the NSSO data is available only for these types of households. A final selection criterion involves keeping only households in India's 16 largest geographical states for which data on rural bank branch openings are available (these 16 states are as in Burgess and Pande (2005)). These restrictions leave us with a total of 408,385 observations in the pooled sample.

Sample statistics in Table 1 indicate that about 14 percent of working-age men and women residing in rural labor households report being self-employed as their primary economic activity. While there is no gender difference in the likelihood of being self-employed, men and women do differ in the type of self-employment they pursue: about a tenth of self-employed men versus almost half of self-employed women are unpaid family workers. Table 1 also shows that more than 80 percent of women had never received schooling during the period, compared to about 60 percent of men. Interestingly, more than 40 percent of men and women belong to the lowest tier of India's class system: the scheduled castes and scheduled tribes (also known as backward castes). A comparison of these statistics with other types of rural households indicates a relatively high representation of uneducated adults and of the lowest-tier social classes in our sample. Table 1 further indicates that the vast majority of men and women are Hindu, married,

and land owners, with a heavier concentration in southern and central states compared to other regions of India. Women are much more likely to live in female-headed households compared to men (11 percent versus 3 percent), while there is not much of a substantive difference between the characteristics of women and men in other types of living arrangements shown. Reflecting the social norm that related households reside together, the average household size is between five and six people, one of whom is often a young child.

To examine how rural banks affect the decision to be self-employed, we merge the employment data with a set of credit variables from the NSSO data files on household loan activity for the same households for 1983, 1987-88, 1993-94, and 1999-2000. The credit variables provide detailed information on loans and debt, including the source and purpose of the loans as well as the value of outstanding debt. Sample means indicate that close to 40 percent of working-age adults in rural labor households in every year have at least one outstanding loan, and the average household loan size is about 4000 rupees in real terms. The data indicate a strong reliance by households on different types of loans: the loans are more than twice as likely to be cash-based loans rather than in-kind and other types of loans, and households with current loans are about three times as likely to have obtained their loan from an informal source (including employers, landlords, moneylenders, shopkeepers, relatives, and friends) as from a formal source (including the government (both national and state), co-operative societies, and banks). Also of note is the purpose of outstanding debt: about 60 percent of households with current loans have used their loans for consumption, 25 percent have used them for production, and the remaining 15 percent have used their loans for other purposes such as debt repayment. Such diversification of credit sources and uses is not specific to India's rural sector. Previous evidence for Madras, one of India's largest cities, indicates that the majority of women who had obtained a loan at a

relatively low interest rate from a credit network had also obtained an informal high-interest loan from a money lender (Noponen 1991). Similar to rural laborers in the NSSO data, Noponen finds that credit recipients in Madras used the loans not only to generate income, but also to smooth consumption and to repay outstanding loans obtained from money lenders.

Our alternative measure of access to credit is new rural bank branches in previously unbanked locations. We merge the employment sample with the macro-level database on rural bank branch openings constructed by Burgess and Pande (2005) for their study on India's banking reform. These data cover India's 16 largest states from 1961 to 2000. The variables include the number of rural bank branches in previously unbanked locations, total bank branches, other measures of financial development, measures of population density, measures of state income, and the number of rural locations in a state (locations in a state are classified as rural on the basis of population numbers and other criteria).

Credit is endogenous for several reasons, including that individuals with higher unobserved ability may be more able to obtain loans and also more likely to engage in self-employment activities. Furthermore, if policy requires that new rural bank branches be placed in areas that are relatively poor, then estimates of the effects of loan activity may also be biased. As discussed in Menon (2006), the use of state-level fixed effects, which capture systematic differences across states in such attributes as average interest rates, aids in removing some of the bias. We instrument for possible self-selection and non-random bank branch placement using the trend-reversals that resulted from the Central Bank of India's imposition and subsequent removal of the 1:4 licensing requirement (as in Burgess and Pande 2005).[4] To improve access to bank credit in rural India, the Central Bank mandated a new 1:4 licensing policy in 1977 whereby a bank could obtain a license to open a branch in a location where other branches already existed

only if it opened four branches in a rural location where no other branch previously existed. This requirement remained in place until 1990. Before this policy was implemented in 1977, banks tended to locate in rich areas with high measures of financial development in order to maximize profits. With the imposition of this licensing policy in 1977, the rate of branch expansion increased more rapidly than before in rural poor areas with low measures of financial development. After 1990, the trend was again reversed, with greater expansion in areas that were more developed. The difference of the 1977-1990 and post-1990 trends from the pre-1977 trend in the correlation between a location's initial measure of financial development and bank branch expansion in rural areas form our set of instruments for rural bank branch placement.

Burgess and Pande (2005) provide evidence that these trend-reversals were statistically significant determinants of rural branch openings in previously unbanked locations. We test that these reversals had no direct effects on self-employment probabilities by analyzing the impact of the trend-reversals on exogenous covariates that could influence self-employment, including different categories of education, land ownership, caste, and religion. These test results are presented in Appendix Table 1. The high *p*-values for the *F*-tests in this table indicate that in all cases we cannot reject the null hypothesis that the sum of the interacted trend variables is zero. That is, there is no evidence of trend-reversals in control variables that could affect self-employment, our dependent variable. The absence of such trend sequences in possibly confounding variables, along with evidence in Burgess and Pande (2005) that the switches in trends are statistically significant, indicate that the trend-reversals constitute a valid set of instruments for analyzing bank branch placement. Location specific initial measures of financial development that influence bank branch placement are also valid instruments for loans obtained by rural labor households (see Burgess *et al*. 2005). Hence we use these initial measures of

financial development interacted with year dummies as instruments for loans obtained by rural labor households.

In estimating equations (1) and (2), our analysis employs four procedures. First, we use probit models to examine the determinants of self-employment and how they differ for men and women. Next, we add measures of household loan activity to a set of "naïve" probit equations for self-employment that treat credit exogenously in order to obtain a benchmark estimate for responsiveness to credit. The coefficients obtained from these naïve estimates underline the importance of treating credit endogenously. Next, we add the Burgess and Pande measures of rural bank branch openings to the self-employment equations for men and women and estimate a set of instrumental-variables probit estimations. Finally, we use the Burgess and Pande variables to instrument for household loan activity in the self-employment regressions, again using instrumental-variables probit models. To test for instrument validity, we report *p*-values from Sargan's over-identification test (1958).

Estimation Results

Determinants of Self-Employment: Individual and Household Characteristics

The estimation results begin with findings from the base regressions for the likelihood of self-employment regressed on the complete set of individual and household characteristics using the pooled 1983 to 2000 sample. The marginal probability estimates for men are reported in Table 2 and for women in Table 3, with all variables set at their means in the calculations of the self-employment probabilities. In both tables, marginal probabilities are reported for overall self-employment (column one), self-employment as an own-account worker (column two), and self-employment as an unpaid family worker (column three). Results indicate that for men, the likelihood of self-employment as own-account workers depends positively on education; the

same is true for men's self-employment as unpaid family workers, but the relationship is not nearly as strong. For example, the probability of self-employment as own-account workers was 0.03 points higher for men with secondary education and 0.02 points higher for men with primary education compared to men with no education. However, the probability of self-employment as unpaid family workers was 0.003 points higher for men with secondary education but measured imprecisely for men with primary education compared to men with no education.

Caste and religion also play an important role in predicting men's self-employment, although in contrasting ways. While men in the scheduled caste group are 0.05 percentage points less likely to be self-employed compared to men in higher tiers of the caste system, men in the scheduled tribes category are about 0.03 percentage points more likely to be self-employed. The direction of this result holds for both own-account self-employed workers and unpaid family workers, but the magnitudes are larger for own-account workers. In India, policy makers often treat the scheduled castes and scheduled tribes as a single category, so these differing effects are unlikely to be caused by differing policies toward the two groups. Anecdotal evidence suggests that members of scheduled tribes have some prior experience with home-based work producing artisan- and cottage-industry goods. This argument is supported by findings in Kijima (2006) that scheduled tribes, often found living in more remote areas than scheduled castes, have relatively limited access to infrastructure, irrigation and communication facilities, and employment opportunities in their villages. Thus, it is likely that scheduled tribes as a group rely more on their own labor skills to make a living, and are thus more likely to be self-employed. The scheduled tribes are also known for their seasonal migration, particularly to areas with markets to produce income by selling their crafts. In contrast, members of scheduled castes tend to be

pressured by members of upper castes to remain in their traditional occupations. Therefore, members of scheduled castes are often employed by others, as opposed to owning and operating their own businesses (Vaid 2007).

Religion also yields a contrasting relationship, with men of Hindu backgrounds having a 0.03 point higher probability of self-employment and Muslim men showing no statistically significant difference compared to men with other religious backgrounds. Results further show that land ownership is one of the strongest predictors of men's self-employment: the probability of self-employment is 0.08 points higher for men who live in households that own land compared to those who do not, with most of this result coming from men's self-employment as own-account workers. Finally, being married and having a larger household are positively associated with men's self-employment, while living in a female-headed household and age have a negative association.

Many of these conclusions also hold for the likelihood of women's self-employment, although there are some nuances. Having an education is not as important an indicator of overall self-employment for women compared to men, mostly because education acts in opposing ways in affecting women's self-employment as own-account workers and as unpaid family workers. We see a strong positive effect for women's self-employment as own-account workers, where the probability of self-employment is 0.04 points higher for women with secondary education and 0.02 points higher for women with primary education compared to women with no education. However, these coefficient estimates are somewhat smaller in absolute value and take on the opposite sign in decisions to become unpaid family workers. Like men, women show strong and interesting differences across caste in the likelihood of self-employment: women in scheduled castes are 0.03 percentage points less likely to be self-employed compared to women

in other castes, and women in scheduled tribes are 0.04 percentage points more likely to be self-employed. Most of this caste effect is coming from self-employment as unpaid family workers.

Religion operates differently for women compared to men, with being Muslim serving as a very strong negative predictor of women's work as own-account workers as well as unpaid family workers, and Hinduism having no statistically significant influence on self-employment. As with men, a household's land ownership is one of the most important predictors of women's self-employment. The probability of being self-employed increases 0.08 points for women who live in households that own land. Interestingly, being married is a positive predictor of both types of self-employment for women, while marriage decreases men's probability of engaging in self-employment as unpaid family workers. Also in contrast to men, women are more likely to become self-employed as they age. Living in a female-headed household has a large negative impact on the likelihood of self-employment as unpaid family workers, which appears to drive the negative effect for overall self-employment. While living in larger households raises the likelihood that women will be unpaid family workers, those living with a child of pre-school age are more likely to work as own-account workers.

Household Loan Activity: "Naïve" Probits

The analysis continues by examining the effect of household loan activity on the self-employment decision using the NSSO loan data merged with the NSSO employment files. Results for men and women are reported in Table 4, where data are pooled from 1983 to 2000. Each reported coefficient and standard error is obtained from a separate probit estimation. We refer to these as the "naïve" probits as they do not instrument for household loans. Results for men in Table 4 indicate that total loans, formal loans, informal loans, and loans taken for production purposes all have strong positive effects on self-employment. Such effects persist

when self-employment is disaggregated into its components of own-account workers and unpaid family workers, although magnitudes are in general larger for own-account workers.

Results for women mirror those for men, with the magnitudes of the loan coefficients again larger for own-account workers compared to unpaid family workers. The repercussions of India's rural bank expansion program are expected to appear in the formal loan category; the naïve estimates in Table 4 suggest that the bank expansion had slightly bigger marginal effects on male self-employed as compared to female self-employed workers. However, these implications change when household loans are treated endogenously, as demonstrated below.

Self-Employment and Rural Bank Expansion: Instrumental Variables

In this section, we provide evidence for the impact of credit on employment by merging the pooled sample of NSSO rural labor households with the Burgess and Pande (2005) state-level data on the number of bank branch openings in previously unbanked rural locations. The number of new bank branches is an alternative measure of credit availability with variation across states and over time.[5] To correct for non-random branch placement, we instrument using the trend-reversals discussed above and in Burgess and Pande (2005). To control for the aggregation bias that may result from combining individual-level data and state-level data in a single regression, we report clustered standard errors in all models. The presence of individual and aggregated right-hand-side regressors causes a downward bias in the estimated standard errors of variables measured at the state level, which leads to an upward bias in the precision attributed to their coefficient estimates. By adjusting the standard errors for correlations, we avoid aggregation bias (Moulton 1990).

Results are reported in Table 5. The most striking result is that women's self-employment responds positively to the number of new rural bank branches, and this result is coming entirely

from self-employment as own-account workers. In particular, women's self-employment as own-account workers rises by 0.16 percentage points following a unit increase in the number of branches opened in rural unbanked locations per capita. In contrast, men's self-employment shows no statistically significant response to new bank branches. The second line of Table 5 indicates that from 1961 to 1990, an additional point of initial financial development reduced men's self-employment totals by 0.01 percentage points annually. All results for men and women include regional and year dummies as well as other controls at the macro and micro levels.

Another way to address aggregation bias is to use a common level of aggregation in all regressors. As a robustness check for our results in Table 5, we used state-level data to implement the instrumental-variables approach. We aggregated the NSSO employment data by state, year, and gender, and merged these with the state-level data on new bank branch openings. Because the rural bank data covered 16 states and we had only 4 years of NSSO data aggregates (1983, 1987-88, 1993-94, and 1999-2000), we effectively had a total of 64 observations for each of the male and female state-level regressions. We constructed several measures of self-employment at the state level, including the average probability of engaging in self-employed work for men and women; the proportion of women among all self-employed individuals; and other measures that compared whether self-employed individuals were own-account workers, employers, or unpaid family workers. The estimations tested the relationship between these alternative state-level aggregated measures of self-employment and bank branch openings using the trend-reversal variables as instruments, along with state-level controls for religion, caste, education, and land; year dummy variables to capture year-specific fixed effects; and state dummy variables to capture state-specific fixed effects. A large number of specification tests that

varied and limited the number of control variables yielded mostly insignificant coefficients, leading us to the conclusion that our limited number of observations yielded too few degrees of freedom for us to implement this approach successfully.

Self-Employment and Household Loans: Instrumental Variables

In the final set of tests, we employ the trend-reversal approach to instrument for household loan activity. In particular, we use a measure of financial development in 1961 (number of bank branches per capita) interacted separately with a 1987 year dummy, a 1993 year dummy, and a 1999 year dummy, to instrument for household loan activity. This approach follows that in Burgess *et al*. (2005). We measure household loan activity using four alternative continuous variables. The first measure is the total nominal value of a loan. The next two loan variables represent nominal values of loans from formal sources and from informal sources, and the final loan variables represent nominal values of loans used for production purposes. In all four measures, individuals who live in households with no loans are assigned a value of zero for the loan variables. In order for the instrumental-variables probit models to achieve convergence, we had to use a 50 percent random sub-sample of our pooled data.

Table 6 reports the results. Each reported coefficient and standard error is obtained from a separate instrumental-variables probit estimation that includes individual characteristics (education, owns land, and female household head), state dummies, and year dummies as control variables. The most striking overall results in Table 6 are the strong positive response of women's self-employment as own-account workers to having a loan and the strong negative response of men's self-employment as unpaid family workers to loan access. For three of the four measures of loan activity, the probability of women's self-employment depends positively and significantly on the loan amount, while the relationship between men's self-employment as

own-account workers and loan activity is small (or even negative) and statistically insignificant. For example, the probability of women's self-employment as an own-account worker rose by 0.102 points for a 10 percent change in total loans, compared to no statistically significant change for men. In contrast, the probability of men's self-employment as an unpaid family worker fell by 0.065 points for a 10 percent change in total loans, compared to virtually no change for women.

The difference between men and women is especially pronounced for formal loans from banks and for loans used for production purposes. Interestingly, women's probability of self-employment as own-account workers shows greater responsiveness to loans from banks compared to loans from informal sources such as moneylenders, employers, and family members.[6]

Discussion and Policy Implications

This paper has examined the role of personal characteristics, household factors, and access to credit as determinants of self-employment in India's rural labor households from 1983 to 2000. We measure access to credit in two ways: the indebtedness of rural labor households in the NSSO data, and the increase in the number of new bank branches in previously unbanked rural locations that resulted from the Central Bank of India's nationalization of banks and the new licensing policy. Results obtained from instrumental variables probit estimations point to a pronounced difference between men and women in the responsiveness of self-employment probabilities to credit: formal bank loans and loans targeted for production purposes have a substantially stronger positive impact on women's likelihood of being self-employed as own-account workers compared to men. Furthermore, whereas such loans significantly reduce the probability of men's self-employment as unpaid family workers, they have little effect on

women's work under this category. This conclusion about the positive responsiveness of women's self-employment as own-account workers to credit also holds when credit is measured at a more aggregate level as the number of new bank branches in previously unbanked rural locations. Such benefits to women from formal banking could be explained by the fact that since they have restricted access to formal employment as compared to men, with the availability of loans, it is rational for them to start a home-based business.[7] Increases in women's likelihood of self-employment as own-account workers may also have provided the required flexibility to ease the path for men's transition in other occupations.

It is well-documented that employment in home-based enterprises reduces vulnerability and improves social security. Hence, at the grass-roots level, the greater outreach in rural finance afforded by India's nationalization of banks and the 1:4 licensing policy benefitted women by increasing their probability of engaging in gainful self-employment beyond unpaid family work. Our findings emphasize the importance of credit in helping people to earn a livelihood from their own trade or business. As noted in Bennett (1992: 31), "Credit is, in a sense, the gateway to productive self-employment."

One of our most striking results from the analysis of self-employment determinants related to class differences within the lowest tier of India's social class system. For both men and women, belonging to a scheduled caste reduced the likelihood of becoming self-employed while belonging to a schedule tribe increased it. Moreover, land ownership serves as one of the strongest predictors of both men's and women's self-employment decisions. This result may be largely explained by the use of land as collateral in obtaining credit. Another notable result is that having children of pre-school age is positively correlated with women's work as own-

account workers. This result is consistent with earlier research that finds female manufacturing-sector workers engaging in home-based work they can combine with childcare (Benería 2007).

Our research indicates that by improving access to financial resources, India's rural bank expansion increased self-employment for women as own-account workers. Employment shifts away from unpaid or low-wage work toward more productive and profitable self-employment activities has obvious welfare implications. In particular, our results signify that rural banking reform brought relatively strong positive benefits to women who may otherwise have suffered due to marginalization in credit markets and insufficient protection from risk.

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Table 1. Individual characteristics and household factors for working-age adults in rural labor households, pooled sample for 1983 to 2000, India.

	Men	*Women*	*Difference (M-W)*
Dependent Variables (% of sample)			
Self-employed: total	0.144	0.144	0.000
	(0.351)	(0.351)	(0.001)
Self-employed: own-account workers and employers	0.125	0.075	0.050***
	(0.331)	(0.264)	(0.001)
Self-employed: unpaid family workers	0.018	0.069	-0.051***
	(0.134)	(0.253)	(0.001)
Categorical Independent Variables (% of sample)			
Education			
No schooling	0.571	0.824	-0.253***
	(0.495)	(0.381)	(0.001)
Primary school	0.286	0.125	0.161***
	(0.452)	(0.331)	(0.001)
Secondary or higher	0.143	0.051	0.092***
	(0.351)	(0.221)	(0.001)
Caste			
Scheduled castes	0.314	0.313	0.001
	(0.464)	(0.464)	(0.001)
Scheduled tribes	0.128	0.141	-0.013***
	(0.335)	(0.348)	(0.001)
Other castes	0.557	0.546	0.011***
	(0.497)	(0.498)	(0.002)
Religion			
Muslim	0.099	0.080	0.018***
	(0.298)	(0.272)	(0.001)
Hindu	0.840	0.862	-0.022***
	(0.366)	(0.345)	(0.001)
Other religions	0.061	0.058	0.003***
	(0.239)	(0.233)	(0.001)
Owns land	0.905	0.902	0.002**
	(0.294)	(0.297)	(0.001)
Married	0.781	0.811	-0.029***
	(0.413)	(0.392)	(0.001)
Female Headed Household	0.030	0.105	-0.075***
	(0.170)	(0.306)	(0.001)
Region			
North	0.137	0.114	0.023***
	(0.344)	(0.318)	(0.001)
East	0.142	0.120	0.022***

	(0.349)	(0.325)	(0.001)
West	0.142	0.161	-0.019***
	(0.349)	(0.368)	(0.001)
South	0.302	0.344	-0.042***
	(0.459)	(0.475)	(0.001)
Central	0.276	0.261	0.015***
	(0.447)	(0.439)	(0.001)
Continuous Independent Variables			
Age (years)	34.145	33.961	0.183***
	(10.991)	(11.025)	(0.035)
No. of household members	5.494	5.346	0.148***
	(2.395)	(2.372)	(0.008)
No. of pre-school children	0.698	0.679	0.019***
	(0.870)	(0.862)	(0.003)
No. observations	231,013	177,372	408,385

Notes: Standard deviations in parentheses for the first two columns; standard errors in parentheses for the final column. Year dummies not included. The notation *** is statistically significant at 1%, ** at 5%, and * at 10%.
Source: Authors' calculations based on NSSO (various years).

Table 2. Men's self-employment decisions: Marginal probabilities and standard errors for effects of individual and household characteristics, 1983 to 2000, India.

	Self-employed: total	*Self-employed: own-account workers*	*Self-employed: unpaid family workers*
Education (ref=no schooling)			
Primary school	0.016*	0.015*	0.001
	(0.009)	(0.008)	(0.001)
Secondary or higher	0.035***	0.029***	0.003**
	(0.013)	(0.011)	(0.001)
Caste (ref=other castes)			
Scheduled castes	-0.050***	-0.042***	-0.004***
	(0.007)	(0.006)	(0.001)
Scheduled tribes	0.034**	0.026*	0.004**
	(0.017)	(0.014)	(0.002)
Religion (ref=other religions)			
Muslim	0.006	0.007	-0.001
	(0.024)	(0.020)	(0.002)
Hindu	0.033***	0.026**	0.004***
	(0.012)	(0.011)	(0.001)
Owns land	0.079***	0.067***	0.006***
	(0.008)	(0.007)	(0.001)
Married	0.010***	0.021***	-0.003***
	(0.004)	(0.004)	(0.001)
Female household head	-0.037***	-0.025***	-0.003
	(0.005)	(0.007)	(0.001)
Region (ref=Central)			
North	-0.001	0.004	-0.002
	(0.035)	(0.030)	(0.003)
East	-0.002	0.003	-0.003
	(0.028)	(0.023)	(0.003)
West	-0.025	-0.022	-0.002
	(0.025)	(0.022)	(0.002)
South	-0.027	-0.020	-0.004
	(0.031)	(0.026)	(0.003)
Age (years)	-0.004***	0.002	-0.001***
	(0.001)	(0.001)	(0.000)
Age^2 ($years^2$/100)	0.009***	0.002	0.001***
	(0.001)	(0.001)	(0.000)
No. of household members	0.011***	0.005***	0.002***
	(0.001)	(0.001)	(0.000)
No. of pre-school children	-0.004	0.001	-0.002***
	(0.002)	(0.002)	(0.000)

Notes: Sample size = 231,013. Standard errors clustered by state are in parentheses. All regressions include year dummies. The notation *** is statistically significant at 1%, ** at 5%, and *at 10%. Standard errors clustered at household level.
Source: Authors' calculations based on NSSO (various years).

Table 3. Women's self-employment decisions: Marginal probabilities and standard errors for effects of individual and household characteristics, 1983 to 2000, India.

	Self-employed: total	*Self-employed: own-account workers*	*Self-employed: unpaid family workers*
Education (ref=no schooling)			
Primary school	0.003	0.016***	-0.011*
	(0.009)	(0.006)	(0.006)
Secondary or higher	0.011	0.035***	-0.016**
	(0.012)	(0.015)	(0.007)
Caste (ref=other castes)			
Scheduled castes	-0.031**	-0.005	-0.023***
	(0.013)	(0.008)	(0.006)
Scheduled tribes	0.041**	0.001	0.032***
	(0.021)	(0.009)	(0.013)
Religion (ref=other religions)			
Muslim	-0.056***	-0.025**	-0.025***
	(0.018)	(0.009)	(0.008)
Hindu	-0.007	-0.013	0.008
	(0.025)	(0.012)	(0.011)
Owns land	0.076***	0.032**	0.038***
	(0.013)	(0.010)	(0.004)
Married	0.035***	0.016***	0.019***
	(0.006)	(0.005)	(0.004)
Female household head	-0.028***	0.011*	-0.046***
	(0.005)	(0.007)	(0.006)
Region (ref=Central)			
North	0.093	0.092**	0.007
	(0.080)	(0.057)	(0.022)
East	-0.012	0.016	-0.020
	(0.035)	(0.021)	(0.018)
West	0.000	0.004	-0.001
	(0.033)	(0.019)	(0.014)
South	-0.009	0.015	-0.019
	(0.036)	(0.021)	(0.017)
Age (years)	0.006***	0.007***	-0.001
	(0.001)	(0.001)	(0.001)
Age^2 ($years^2$/100)	-0.006***	-0.007***	0.001*
	(0.002)	(0.001)	(0.001)
No. of household members	0.006***	0.000	0.005***
	(0.001)	(0.001)	(0.001)
No. of pre-school children	0.001	0.005***	-0.003*
	(0.003)	(0.002)	(0.002)

Notes: Sample size = 177,372. Standard errors clustered by state are in parentheses. All regressions include year dummies. The notation *** is statistically significant at 1%, ** at 5%, and *at 10%. Standard errors clustered at household level.
Source: Authors' calculations based on NSSO (various years).

Table 4. Naïve probit estimates for impact of household loan activity on self-employment decisions, 1983 to 2000, India.

	Self-employed: total	*Self-employed: own-account workers*	*Self-employed: unpaid family workers*
Men			
Total Loan	0.020***	0.016***	0.002***
	(0.001)	(0.002)	(0.000)
Formal Loan	0.031***	0.024***	0.003***
	(0.006)	(0.004)	(0.001)
Informal Loan	0.015***	0.012***	0.002***
	(0.003)	(0.003)	(0.000)
Production Loan	0.040***	0.032***	0.003***
	(0.005)	(0.004)	(0.001)
Women			
Total Loan	0.022***	0.013***	0.008***
	(0.003)	(0.002)	(0.001)
Formal Loan	0.026***	0.014***	0.009***
	(0.003)	(0.002)	(0.003)
Informal Loan	0.023***	0.013***	0.008***
	(0.004)	(0.002)	(0.001)
Production Loan	0.034***	0.017***	0.013***
	(0.002)	(0.001)	(0.002)

Notes: Sample size = 231,013 for men and 177,372 for women. Standard errors clustered by state are in parentheses. Each marginal probability estimate is obtained from a separate probit regression that includes the full set of individual and household characteristics listed in Tables 2 and 3. The notation *** is statistically significant at 1%, ** at 5%, and *at 10%.
Source: Authors' calculations based on NSSO (various years).

Table 5. Instrumental-variables evidence for impact of bank branch expansion on self-employment decisions, 1983 to 2000, India.

	Men:			*Women:*		
	Self-employed: total	*Self-employed: own-account workers*	*Self-employed: unpaid family workers*	*Self-employed: total*	*Self-employed: own-account workers*	*Self-employed: unpaid family workers*
Number of branches opened in rural unbanked locations/capita	0.041	0.038	0.045	0.097*	0.163***	-0.073
	(0.035)	(0.032)	(0.063)	(0.054)	(0.048)	(0.076)
Number of bank branches per capita in 1961*(1961-2000) trend	-0.010**	-0.010**	-0.006	0.003	-0.005	0.016*
	(0.005)	(0.004)	(0.008)	(0.008)	(0.010)	(0.008)
Post-1989 dummy*(1990-2000) trend	0.111	0.114	0.043	0.118	0.359**	-0.285
	(0.090)	(0.084)	(0.198)	(0.111)	(0.150)	(0.183)
Regional and year dummies	YES	YES	YES	YES	YES	YES
Other controls	YES	YES	YES	YES	YES	YES
Over-identification test	[0.280]	[0.000]	[0.160]	[0.030]	[0.380]	[0.380]

Notes: Sample size = 231,013 for men and 177,372 for women. Standard errors clustered by state are in parentheses and *p*-values are in square brackets. Each set of marginal probability estimates is obtained from separate instrumental-variables probit regressions (using maximum likelihood estimation) that include the full set of individual and household characteristics listed in Tables 3 and 4; plus state population density, log state income per capita, and log rural locations per capita, each in 1961 and each interacted with a time trend, a post-1976 time trend, and a post-1989 time trend. The over-identification test is due to Sargan (1958). The *p*-values from this test indicate that in four of the six cases we cannot reject the null that our instruments are valid. The notation *** is statistically significant at 1%, ** at 5%, and * at 10%.

Source: Authors' calculations based on NSSO (various years).

Table 6. Instrumental-variables evidence for impact of household loan activity on self-employment decisions, 1983 to 2000, India.

	Self-employed: total	*Self-employed: own-account workers*	*Self-employed: unpaid family workers*
Men			
Total Loan	-0.704*	-0.119	-0.648***
	(0.423)	(0.344)	(0.195)
Formal Loan	-1.116**	-0.992	-1.038**
	(0.564)	(0.605)	(0.413)
Informal Loan	0.108	0.338	-0.559
	(2.382)	(1.862)	(0.415)
Production Loan	-1.473*	-1.392	-1.140**
	(0.760)	(0.914)	(0.550)
Women			
Total Loan	0.541	1.017***	-0.086
	(0.782)	(0.210)	(0.419)
Formal Loan	0.968	1.595***	-0.243
	(0.979)	(0.576)	(0.994)
Informal Loan	0.381	0.931	0.162
	(1.058)	(1.425)	(0.515)
Production Loan	1.607	1.990***	0.108
	(1.213)	(0.320)	(1.562)

Notes: The sample is a 50% random sub-sample in order to achieve convergence. Standard errors clustered by state are in parentheses. Each marginal probability estimate is obtained from a separate instrumental-variables probit regression that includes individual characteristics (education, owns land, and female household head), state dummies, and year dummies as control variables. The instruments are a measure of financial development in 1961 (number of bank branches per capita) interacted separately with a 1987 year dummy, a 1993 year dummy, and a 1999 year dummy. The notation *** is statistically significant at 1%, ** at 5%, and *at 10%.
Source: Authors' calculations based on NSSO (various years).

Appendix Table 1. Probit model tests for instrument validity, 1983 to 2000, India.

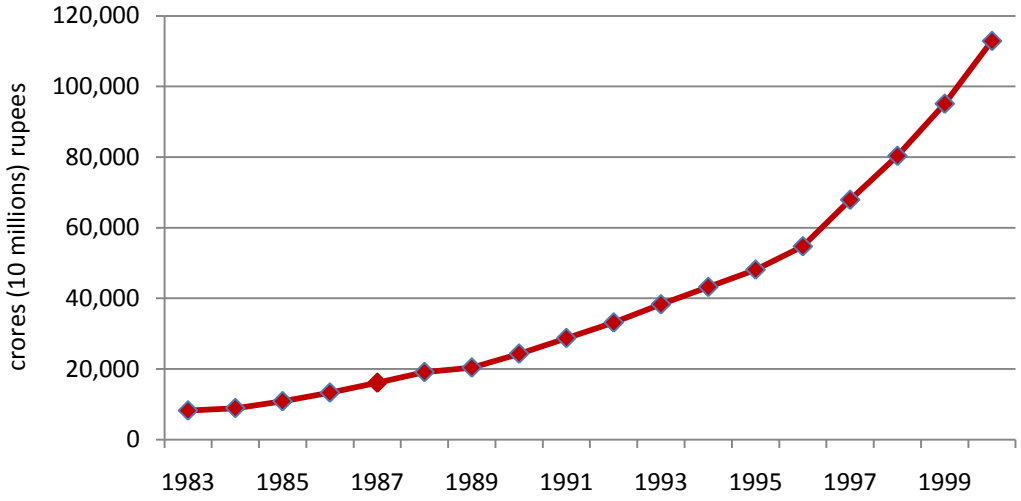
	Dummy for those who are illiterate	*Dummy for those with primary education*	*Dummy for those with post primary education*	*Dummy for those who own land*	*Dummy for members of Scheduled Tribe*	*Dummy for those who are Hindu*
Number of bank branches per capita in 1961*(1961-2000) trend	-0.096***	0.082***	0.067***	-0.015	-0.092***	-0.021
	(0.012)	(0.008)	(0.008)	(0.019)	(0.033)	(0.014)
Number of bank branches per capita in 1961*(1977-2000) trend	0.101***	-0.096***	-0.070***	0.017	0.074*	0.029
	(0.015)	(0.010)	(0.009)	(0.018)	(0.042)	(0.022)
Number of bank branches per capita in 1961*(1990-2000) trend	-0.003	0.004	0.000	0.009	-0.001	-0.011
	(0.013)	(0.012)	(0.009)	(0.022)	(0.027)	(0.014)
Post-1989 dummy*(1990-2000) Trend	-0.049	-0.097*	0.180***	-0.052	0.251*	-0.027
	(0.071)	(0.050)	(0.049)	(0.130)	(0.140)	(0.077)
State and year dummies	YES	YES	YES	YES	YES	YES
Other controls	YES	YES	YES	YES	YES	YES
F-test 1	0.310	2.540	0.840	0.030	1.780	0.610
	[0.576]	[0.111]	[0.358]	[0.873]	[0.182]	[0.435]
F-test 2	0.010	1.300	0.300	0.160	0.760	0.110
	[0.916]	[0.254]	[0.585]	[0.689]	[0.383]	[0.744]

Notes: Sample size = 408,385. Standard errors clustered by state are in parentheses and *p*-values are in square brackets. *F*-test 1 and *F*-test 2 are the joint significance tests for coefficients in the first two rows and the first three rows, respectively. Independent variables include the interaction of a post-1976 dummy with a post-1976 time trend, but this variable is dropped from models due to collinearity. Other controls include state population density, log state income per capita, and log rural locations per capita, each in 1961 and each interacted with a time trend, a post-1976 time trend, and a post-1989 time trend. The notation *** is statistically significant at 1%, ** at 5%, and * at 10%.

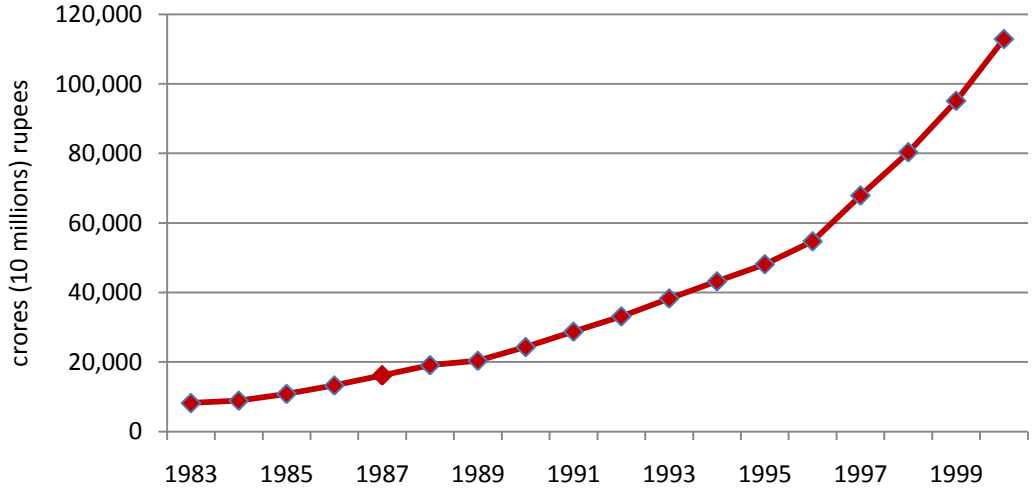
Source: Authors' calculations based on NSSO (various years).

Figure 1. Commercial bank activity, 1983 to 2000, India.

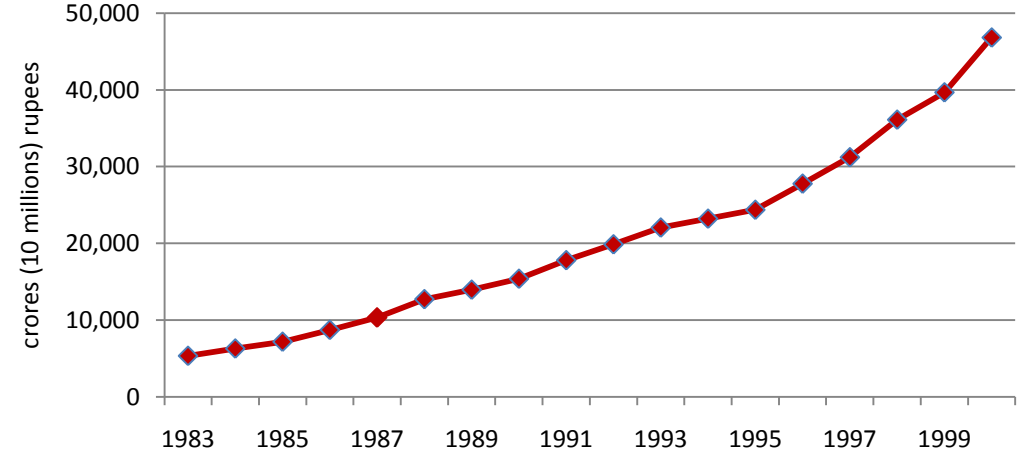
Panel A. Cumulative Branch Openings



Panel B. Total Commercial Bank Deposits in Rural Sector



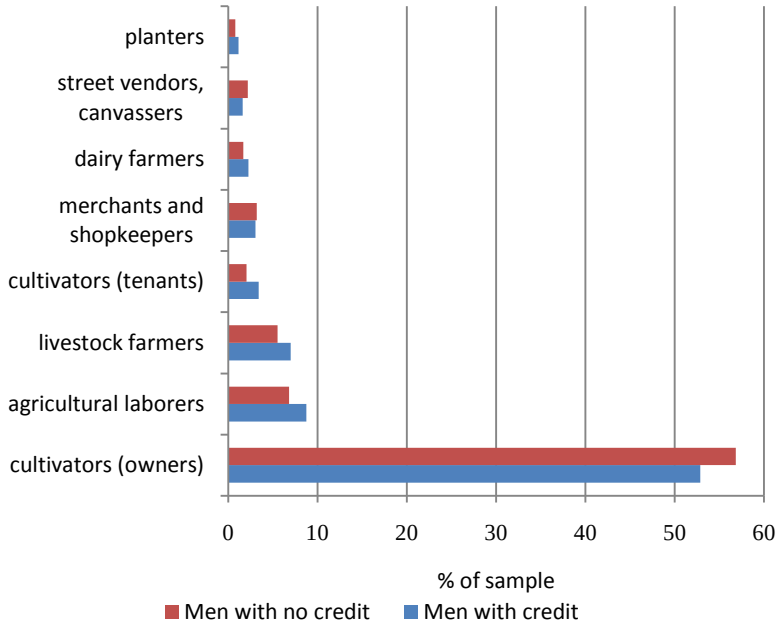
Panel C. Total Commercial Bank Advances in Rural Sector



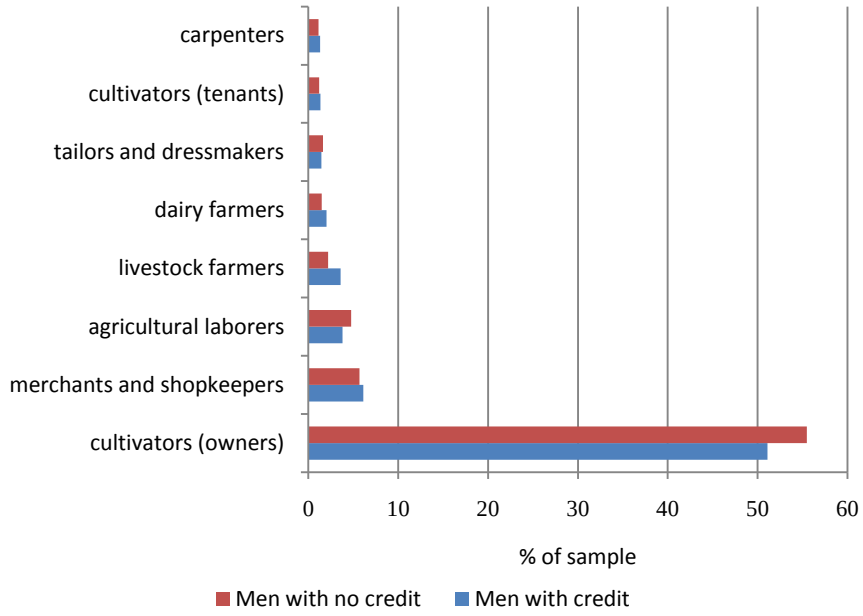
Source: Authors' calculations using Burgess and Pande (2005).

Figure 2. Self-employed men and the most common occupations by loan status, 1983 to 2000, India.

Panel A. 1983



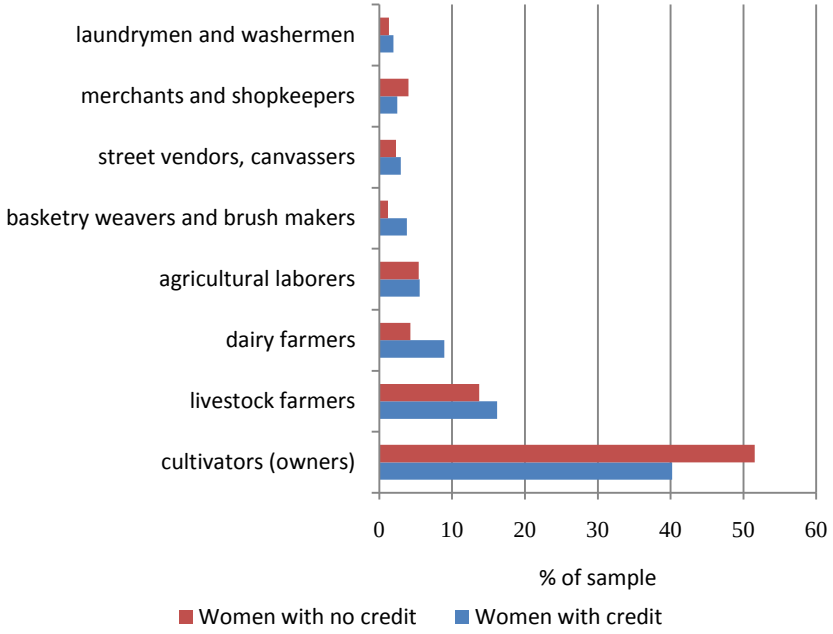
Panel B. 1999-2000



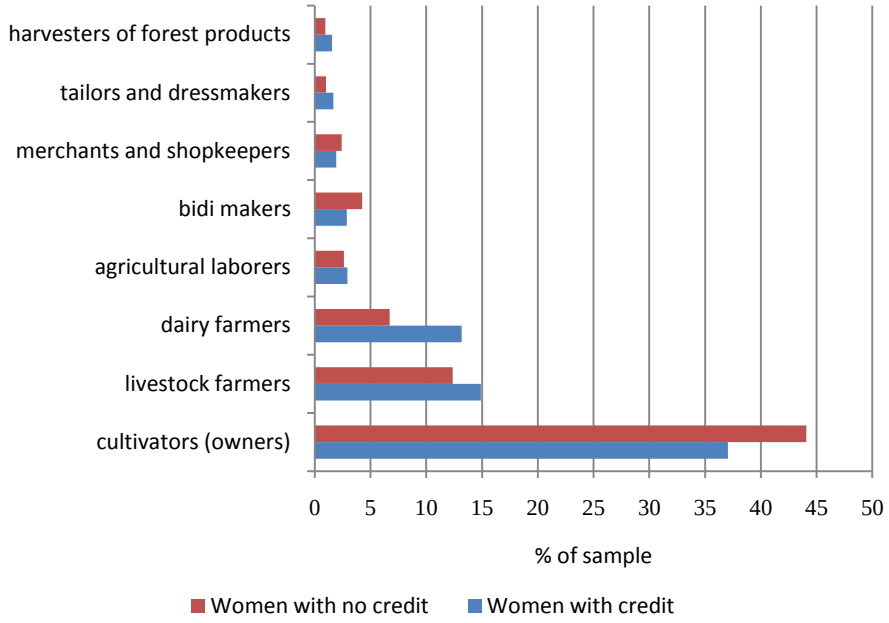
Source: Authors calculations based on NSSO (various years).

Figure 3. Self-employed women and the most common occupations by loan status, 1983 to 2000, India.

Panel A. 1983



Panel B. 1999-2000



Source: Authors calculations based on NSSO (various years).

ENDNOTES

[1] These results for developing countries are consistent with findings for industrialized countries that the decision to become self-employed is constrained by access to credit, and relief of those constraints through a loan or a windfall gain increases the probability of becoming or remaining self-employed (e.g. Lindh and Ohlsson 1996, Holtz-Eakin *et al.* 1994a, 1994b).

[2] In the NSSO schedules, individuals who are self-employed are divided into three groups: "own-account workers", "employers", and "unpaid family workers". "Own-account workers" are those individuals who worked in their own household enterprise. "Employers" are those individuals who hired others to work in the family enterprise, and "unpaid family workers" are those who worked as helpers in the household enterprise. In our analysis, we combined "employers" with "own-account workers" because less than 1 percent of the self-employed workers in our sample reported "employer" as their primary economic activity. Thus the two categories of self-employment in our study are "own-account workers" and "unpaid family workers". This classification is similar to that in Raveendran *et al*. (2006).

[3] This first stage reduced form mirrors the reduced form in Pitt & Khandker (1998).

[4] As in Burgess and Pande (2005), a "trend" variable is measured as the difference between the four-digit year variable and a threshold value. For example, "trend61" is the difference between the year variable and 1960. Hence a "trend-reversal" is the change in the direction of effects measured by the different "trend" variables.

[5] Aggregation to the village level rather than state level may generate more precise results, but detailed banking data released by the Reserve Bank of India are at the state level rather than village level.

[6] Note that we re-ran all regressions using real loan values (nominal values deflated with India's CPI) as a robustness check. Our results did not differ in any meaningful way.

[7] This potential explanation is supported with evidence in Pitt and Khandker (2002) for Bangladesh, which cites women's small amount of time spent in paid market work relative to women's total time spent working as the main reason why their labor supply responsiveness to credit does not vary much by seasons, in contrast to that of men.