Economics Bulletin

Volume 36, Issue 4

Determinants of Credit Rationing in Ethiopia: Firm-Level Evidence

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Abstract

This study examines the determinants of credit rationing at the firm level in Ethiopia using the World Bank Enterprise Survey. A seemingly unrelated bivariate probit model is estimated to control for potential selection bias. The result reveals that in the context of Ethiopia, the age of firm, sales growth, and having checked financial statement by external auditor reduces the probability of being credit rationed. An increase in sales growth lowers the probability of being credit rationed by 21%. Firms that checked their account by external auditor reduces the probability of being rationed by 18.5%. Female ownership, the profitability of the firm, and firm size are insignificant.

Citation: Bizuayehu Bedane, (2016) "Determinants of Credit Rationing in Ethiopia: Firm-Level Evidence", *Economics Bulletin*, Volume 36, Issue 4, pages 2161-2170
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Submitted: February 29, 2016. **Published:** November 26, 2016.

1. Introduction

One of the main reasons for credit rationing is information asymmetry. Due to information asymmetry, lenders are unable and/or costly to identify bad and good borrowers. Moreover, it is also costly to monitor the loan. This implies lenders do not lend money even if borrowers are willing to pay higher interest rate. According to Stiglitz and Weiss (1981), credit rationing is where among identical loan applicants some loan applicants receive a loan and others do not or where lenders approve smaller loan amounts than borrowers requested.

Moreover, Levenson and Willard (2000) argue credit rationing includes discouraged potential borrowers. Discouraged potential borrowers are individuals who do not apply for a loan due to fear of rejection or high collateral. Thus, population estimates of credit rationing must adjust for the presence of discouraged borrowers.

Previous studies examined different aspects of credit rationing**.** For instance, Drakos and Giannakopoulos (2011) examined the determinants of credit rationing using a firm-level data for 26 transition economies and find that credit rationing depends on firm size, profitability, sales growth, ownership type, legal status, sectoral heterogeneity, and the country-specific level of domestic credit. Kjenstada, E. et al (2014) constructed a synthesized model to study credit rationing by loan size and found credit rationing is related with agency cost and increased loan size.

Mijid, N., and Bernasek, A. (2013) examined the gender aspect of credit rationing and finds higher loan denial rates and lower loan application rates among women compared with men. Whereas, Majid(2015) examined type one credit rationing, where borrowers receive a small loan than they requested, and found that women business owners are not likely to be type one rationed.

Levenson and Willard (2000) investigate credit rationing for small business in the US. Their study finds that a maximum of 6.36 percent of firms was credit rationed in the U.S. in 1987–88; two-thirds of these, 4.22 percent of the total, were discouraged from applying by their expectations of denial. Moreover, constrained firms are smaller, younger, and more likely to be owned by their founders than those firms that successfully applied for external finance. Kremp and Sevestre (2013) argues that despite the stronger standards used by banks when granting credit, French SMEs do not appear to have been strongly affected by credit rationing since 2008. Ali and Deininger (2012) shows that credit rationing is the result of risk related factors in rural areas in Ethiopia.

The main purpose of this study is to examine the determinants of credit rationing at the firm level in Ethiopia. The Ethiopian enterprise survey which is collected by The World Banks is used. In this study, firms are credit rationed if their loan application is rejected and firms do not apply for a loan due to fear of rejection. Based on this, from a total of 644 firms, 313 firms are credit rationed.

In such kind of studies, one of the estimation issues is selection bias. To control for selection bias a seemingly unrelated bivariate probit model is estimated. This model is appropriate when the dependent variable of both the first and the second equation is binary. The appropriateness of the model is tested using the likelihood ratio test and the test rejects the null

hypothesis. A study of this nature that uses a data from a developing country and a unique estimation technique that controls for selection bias enable us to better understand credit rationing at the firm level in the developing world. As far as we know this study is the first of its kind in the context of Ethiopia.

Most firms (72%) are located in the capital, Addis Ababa. 85% of the firms are owned by Africans; out of this 95.5% of the firms are owned by Ethiopians. Only 12% of the firms are run by a female manager. From the total firms, 46.6% are small size followed by the medium size firms (32%).

The estimated result from the bivariate probit model uncovers older firms, firms with increased sales growth, and firms that have checked their financial statement by the external auditor are less likely to be credit rationed. An increase in sales growth lowers the probability of being credit rationed by 20%. Firms that checked their account by external auditor reduces the probability of being rationed by 18.6%. Firm size, the profitability of the firm, and female ownership do not affect the probability of being credit rationed.

2. Methodology and Data Description

2.1. Data Source and Description

This study used a data from the World Bank Enterprise Survey that is collected in 2011 in Ethiopia. There are 644 firms interviewed. The data includes information on infrastructure and service, sales and supplies, the degree of competition, finance, and Labor. Most firms (72%) are located in the capital, Addis Ababa. 85% of the firms are owned by Africans; out of this 95.5% of the firms are owned by Ethiopians.

Table 1 shows the summary statistics. As we can see from the table, 50% of the firms are credit rationed and 84% of the firms from the total sample do not take a loan. Only 19% of the firms do not have profit. 71.8%, 92.4% of the firms have checked their account by the external auditor and have a bank account, respectively. The average age of a firm is 11.9 years but the standard deviation is high. 69% of the firms have an increase in sales over three year's period.

Only 12% of the firms are run by a female manager. From the total firms, 46.6% are small size followed by medium size (32%). Moreover, 32% of the firms have an internet connection, on average 90.5% of working capital is financed from internal funds or retained earnings while only 0.8% of working capital is financed by credit.

The dominant industry that firms engaged in Ethiopia is manufacturing (52.8%) followed by retail and wholesale (31.8%). In terms of legal status, 62.4% of the firms are owned by single owner followed by the limited partnership (12%). 49.5% of the managers of the firms have a graduate degree.

3. **Table 1: Summary Statistics**

Variables	**Mean**	**Sd**
credit rationed	0.502	0.500
No loan	0.844	0.363
No profit	0.194	0.396
Audit	0.718	0.450
Bank account	0.924	0.266
Age	11.901	10.798
Sales increase	0.693	0.462
Female manager	0.121	0.327
Small	0.466	0.499
Large	0.214	0.411
Medium	0.320	0.467
Internet	0.323	0.468
Cash	90.517	21.551
Trade credit	0.835	5.836
Domestic sale	93.961	21.024
Industry Dummy		
Manufacturing	0.528	0.500
Construction	0.031	0.174
Transport	0.033	0.178
Hotel /restaurant	0.045	0.208
Retail and wholesale	0.318	0.466
IT and Repair	0.045	0.207
Legal Status Dummy		
Shareholding	0.020	0.141
Shareholding private	0.045	0.208
Partnership	0.043	0.204
Limited partnership	0.129	0.335
Sole proprietorship	0.624	0.485
Other	0.005	0.068
Manger's Educational Level Dummy		
No education	0.008	0.088
Primary	0.025	0.156
Secondary	0.158	0.365
Vocational	0.104	0.306
Some University	0.205	0.404
Graduate	0.495	0.500

Source: World Bank Enterprise Survey, 2011

3.1. Variable Description

In an effort to create a dependent variable for loan demand function firms are classified into two based on their response to the question "Establishment has a line of credit or loan from a financial institution." If the firm owner says yes it is categorized as loan and if they say no as no loan. Then No loan (NL) is NLi=1 if the firm does not take a loan, 0=otherwise.

Based on the literature, credit rationed firms can be categorized in two ways. The first is based on their response to the reason for not applying for a loan. The second is based on the outcome of their application.

First, the firms are asked whether they apply for a loan or not. Those firms that do not apply for a loan are asked the following question. "What was the main reason why this establishment did not apply for any line of credit or loan?" The respondents choose one of the following reasons.

i) No need for a loan ii) Application procedures were complex iii) Interest rates were not favorable iv) Collateral requirements were too high v) Size of loan and maturity were insufficient vi) Did not think it would be approved vii) Other

Firms that respond to no need for loan are considered as not credit rationed. The rest of the firms are categorized as credit rationed. This constitutes the discouraged potential borrowers. The Second classification of firms is based on the outcome of their loan application. Respondents were asked "Referring only to this most recent application for a line of credit or loan, what was the outcome of that application?" and they choose among the following options, i) Application was approved ii) Application was rejected iii) Application still in process. A firm is credit rationed if the loan application is rejected.

So, credit rationed firms are a combination of firms with rejected application plus discouraged potential borrowers. Out of 644 firms, 148(23%) applied for a loan and only 87(59%) of them have their application approved. Moreover, from 476 of the firms that do not apply for loan 224 do not need a loan. The rest need a loan but do not apply for a different reason. When we aggregate the two, 313 firms are credit rationed. Then a firm is credit rationed if R_i=1, where the firm does not take loan and firm does need a loan but loan application is rejected or does not apply for loan due to fear of rejection, 0= otherwise

Based on economic theory and previous studies key determinants of credit rationing include profitability and sales growth, firm size, firm age, the gender of major owner and gender of the manager of the firm, use of external auditor, and bank relationship represented by the availability of saving and checking account.

We expect that the probability of a firm being rationed is lower for older firms. Lenders can have enough information about the firm's track record. It is also an indicator of strength and quality of the firm. Firm size also matters. Large firms have less probability of being credit rationed in the sense that large firm's risk of failure is less.

Firms with higher sales growth and profitability are also less likely to be credit rationed. Firms that use external auditor have a lower probability of being rationed, where using external auditor is an indicator of financial transparency. Good and established relationships of a firm with a bank help the lenders to get information about their borrowing history and are less likely

to be credit rationed. The gender of the owner and manager of the firm is expected to affect the amount of loan and loan approval rate.

Other Control variables are also included to control for unobserved heterogeneity in credit rationing mechanism. These variables include the educational level of the firm's manager, working capital trade credit, working capital cash, sectoral dummies, the legal status of the firm, and internet use by the firm.

3.2. Econometrics Model

From the definition of credit rationing, in this study, we can see that firms are observed if they do not take out a loan. This implies that there is a potential selection bias since the sample is not drawn randomly from the population. This results in a correlation of the errors of the two seeming unrelated equations. Given the selection bias, if we estimate the two equations separately the estimated results will be biased and inconsistent. The right model for a two equation with a binary dependent variable is bivariate probit model. According to Greene (2011), to check whether bivariate probit model is the right model or not we need to conduct a likelihood ratio test. If the test rejects the null hypothesis bivariate model is the appropriate model.

For this study, the first equation is the credit rationing equation (where 1= a firm is credit rationed, 0=otherwise) as a function of different firm-level characteristics. The second equation is the loan demand equation where the dependent variable is 1 if the firm does not take a loan, 0 otherwise. The model is specified following Greene (2011) and Drakos and Giannakopoulos (2011).

$$NL^* = x_1'\beta_1 + \varepsilon_1 \quad NL = 1 \ if \qquad NL^* \le 0, 0 \ otherwise$$

$$R^* = x_2'\beta_2 + \varepsilon_2, \ R = 1 \ if \ R^* > 0, \ 0 \ otherwise$$

$$\begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \end{pmatrix} | \ x_1, x_2 \ \square \left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix} \right]$$

$$(R, x_i) \ observed \ only \ where \ NL = 1$$

Where $\rho = \text{cov}(\varepsilon_1, \varepsilon_2)$, x_i's are the explanatory variables.

Based on the equations above the log-likelihood function to be maximized is given as follows

$$LogL = \prod_{Nl=1, R=1} \Phi(x_1'\beta_1, x_2'\beta_2, \rho) \prod_{Nl=1, R=0} \Phi(x_1'\beta_1, x_2'\beta_2, \rho) \prod_{Nl=0} \phi(x_2'\beta_2)$$

Where $\Phi(.)$ is the bivariate normal cumulative probability, $\phi(.)$ is the normal cumulative probability for the no loan equation. The maximum likelihood is maximized with respect to β_1, β_2, ρ. The magnitude of the estimates of the bivariate model cannot be directly analyzed. For that, we need to calculate the marginal effects (dy/dx).

4. Results and Discussion

The appropriateness of the bivariate probit model is examined by conducting the Likelihood ratio test as suggested by Greene (2011). The LR test result is significant at 1% implying the null hypothesis of no selection bias is rejected. Moreover, the estimated result for rho is significant supporting the LR test. This means the bivariate probit model is the suitable model for the analysis.

The next step is estimating the seemingly unrelated bivariate probit model. The marginal effects for the credit rationing equation are calculated because the coefficients of the bivariate probit regression are not directly interpretable. All results are reported in table 2.

The estimated result reveals that the probability of being credit rationed is lower for firms with higher sales growth. An increase in sales growth lowers the probability of being credit rationed by 20%. This is consistent with the finding by Levenson and Willard (2000) for small firms in the US. Firms that checked their account by external auditor reduces the probability of being rationed by 18.6%. Kirschenmann, K. (2016) argued credit rationing is higher for opaque firms than transparent firms in Bulgaria**.**

Having saving or checking account, which is the proxy for bank relationship, is insignificant. Bank relationship is important in developed nations (see Becchetti et al, 2011). But there is evidence that in underdeveloped banking system like Ethiopia domestic banks have the ability to monitor soft information firms (Detragiache, et al, 2008). Moreover, the banking sector is restricted only for domestic banks in Ethiopia.

Having no profit does not affect the probability of being credit rationed. Medium firm size also found insignificant. Large firm size is insignificant and negative indicating large firms are less likely to be credit rationed as compared to the base category, small firms. This can be due to the definition of firm size which is based only on the number of employees instead of available capital or other firm attributes. The longer the age of the firm implies the lower the probability of being credit rationed (0.7% lower) which is in line with the finding by Levenson and Willard (2000).

The gender of the owner of the firm does not affect the probability of credit rationing. The model is estimated using a dummy for female ownership and found negative and insignificant, which is consistent with the finding by Majid (2015). Then, it is replaced by a dummy for the female manager and the result is still negative and insignificant. This suggests that there is no evidence supporting the claim that female owners are credit rationed.

Other covariates are also used to control for firm heterogeneity. The estimated result turns out positive and significant coefficient for firms with a larger percentage of working capital purchased on credit. However, firms using their own fund for working capital have also a higher probability of being rationed.

A dummy for legal status is also incorporated. Except the dummy for Shareholding Company with shares traded in the stock market all are insignificant. The coefficient of Shareholding Company with shares traded in the stock market is negative and significant. This means shareholding companies are less likely to be rationed as compared to the base category,

other. The dummy for internet connection is significant and negative implying that firms with a high-speed internet connection have a lower probability of being rationed. Internet connection is an indicator of efficient and effective communication with their customers, which is important attribute considered by lenders.

From the industry dummies, only the dummy for transport is negative and significant. This indicates that firms engaged in the transport sector are less likely to be rationed as compared to the base category IT and repair sector.

Moreover, the educational status of the manager of the firm is included. Firms managed by managers with some university level education are more likely to be credit rationed as compared to firms managed by managers with a graduate degree.

Sales increase, industry dummy hotel and restaurant, legal status shareholding with shares traded in the stock market, partnership, limited partnership, percent of working capital cash, percent of working capital credit, and firms with managers with secondary education significantly determine demand for loan.

Table 2: Estimated Results for the Bivariate Probit Model

	Rationed		No loan		Marginal Effects	
Variables	**coef**	**se**	**coef**	**se**	**coef**	**se**
No Profit	-0.215	0.212	0.355	0.295	-0.038	0.059
Annual financial statement checked by auditor	-0.655***	0.180	-0.335	0.223	-0.186***	0.048
Firm has checking or saving account	-0.159	0.281	-0.185	0.391	-0.051	0.077
Age of the firm	-0.025***	0.008	-0.009	0.009	-0.007**	0.002
Sales growth in the last three years	-0.720***	0.171	-0.278	0.197	-0.201***	0.045
Female owner	-0.393	0.262	-0.050	0.347	-0.105	0.069
Firm size large	-0.043	0.246	-0.389	0.270	-0.031	0.068
Firm size medium	0.119	0.179	0.047	0.230	0.033	0.049
Manufacturing	0.455	0.402	-0.238	0.424	0.106	0.108
Construction	0.355	0.558	-0.376	0.530	0.073	0.155
Transport	-1.057*	0.614	-0.117	0.531	-0.280*	0.164
Hotel and restaurant	0.270	0.520	-1.027*	0.550	-0.018	0.137
Retail and wholesale	0.546	0.408	-0.622	0.420	0.110	0.111
Shareholding company with shares traded	-4.831***	0.319	-1.032	0.720	-1.305***	0.115
Shareholding company with non-traded shares	0.206	0.376	-0.207	0.376	0.043	0.103
Sole proprietorship	0.361	0.228	-0.004	0.286	0.094	0.064
Partnership	-0.301	0.476	-1.088***	0.398	-0.133	0.126
Limited partnership	0.410	0.305	-0.588*	0.333	0.076	0.084
Internet	-0.375**	0.171	-0.200	0.209	-0.108**	0.047
Working capital financed from internal funds	0.008**	0.003	0.023***	0.005	0.003***	0.001
Working capital purchased on credit	0.036**	0.015	0.025*	0.014	0.010**	0.004
No education	-0.275	0.748	0.305	0.534	-0.056	0.206
Primary school	-0.429	0.382	-0.552	0.364	-0.139	0.099
Secondary school	0.184	0.212	0.649**	0.290	0.080	0.059
Vocational training	0.233	0.303	0.061	0.326	0.064	0.084
Some university	0.454**	0.220	0.182	0.274	0.127**	0.062
Constant	-0.054	0.640	0.207	0.768		
Rho	0.470***	0.130				
log likelihood	-311.401					
Number of observations	365					
LR test (Chi2)	13.1391					

note: *** p<0.01, ** p<0.05, * p<0.1

5. Conclusion

This study used a firm level data from Ethiopia to examine the determinants of credit rationing. In this study, firms are credit rationed if their loan application is rejected or they do not apply for a loan due to fear of rejection. A seemingly unrelated bivariate probit model is used for the analysis. The diagnosis test for the suitability of bivariate probit model rejects the null of no selection bias. This implies that bivariate probit model is the appropriate model.

The result shows that the probability of being rationed is lower when sales growth is high. Moreover, older firms are less likely to be credit rationed. Firms using an external auditor to check their financial status are less likely to be credit rationed. There is no evidence supporting credit rationing based on gender. The dummy for female owner and female manager is insignificant. Firm size dummy, medium is insignificant and positive while large firm size is insignificant and negative

6. Reference

Ali, D. A., and Deininger, K. (2012). Causes and implication of credit rationing in rural Ethiopia: the importance of spatial variation, *World Bank Policy Research Working papers 6096*.

Becchetti, L., Garcia, M., and Trovato, G.(2011). Credit rationing and credit view: empirical evidence from an ethical bank in Italy. *Journal of Money, Credit and Banking*.43(6) 1217-1245.

Detragiache,E., Tressel, T., and Gupta, P. (2008). Foreign banks in poor countries: theory and evidence. *The Journal of Finance,* Vol. LXIII (5) 2123-2160.

Drakos, K., and Giannakopoulos, N. (2011). On the determinants of credit rationing: firm level evidence from transition countries. *Journal of International Money and Finance*. (30)1773-1790.

Greene, W. (2011). Econometric Analysis: Prentice Hall.

Jaffee D. and Stiglitz J.(1990).Credit rationing. In Friedman, B. and Hahn, F.(eds) *Handbook of Monetary Economics*. (2) 837-888.

Kirschenmann, K. (2016). Credit rationing in small firm-bank relationships. *Journal of Financial Intermediation*. 26. 68-99.

Kjenstada, C. E, Su, X. and Zhang, L.(2014). Credit rationing by loan size: A synthesized model. *The Quarterly Review of Economics and Finance. (*55) 20–27.

Kremp, E., Sevestre, P.(2013). Did the crisis induce credit rationing for French SMEs? *Journal of Banking and Finance*. (37) 3757–3772.

Levenson, A. and Willard, K. (2000). Do Firms Get the Financing They Want? Measuring Credit Rationing Experienced by Small Businesses in the U.S. *Small Business Economics*. (14) 83–94.

Mijid, N. (2015). Gender differences in Type 1 credit rationing of Small businesses in the US. *Cogent Economics and Finance* (3)1021553.

Mijid , N. and Bernasek, A(2013). Gender and the credit rationing of small businesses. *The Social Science Journal*. (50)55–65.

Stiglitz, J., and Weiss, A. (1983). Credit rationing in Markets with imperfect information, *The American Economic Review*. 71(3),393-410.

7. Appendix

Table 3: Variable Description

Variable	Definition
Age	Number of years the firm is in operation
Credit rationed	1= if the firm is credit rationed, 0 =otherwise
No loan	1= if the firm did not take a loan, 0 =other wise
Audit	1=Annual financial statement checked by auditor,0=otherwise
No Profit	1=no profit,0=otherwise
Sales growth	1= if sales grows by more than 10% in the last three years, 0=otherwise
Female manager	1=the manager is female,0=otherwise
Internet	Does the firm have a high-speed internet connection on its premises?
Cash	% Of Working capital financed from internal funds/retained earnings
trade credit	% Of working capital purchased on credit/advances from suppliers /customers
Small	1 =if firm is small size,0 =otherwise
Medium	1 =if firm is medium size, 0 =otherwise
Large	1 =if firm is large size, 0 =otherwise
Bank account	1=the firm has checking or saving account,0=otherwise
Manufacturing	1=manufacturing, 0=otherwise
Construction	1=Construction, 0=otherwise
Transport	1=Transport , 0=otherwise
Hotel and restaurant	1=Hotel & restaurant, 0=otherwise
Retail &wholesale	1=Retail and wholesale, 0=otherwise
IT and repair	1= IT and motor repair service,0=otherwise
Domestic sale	% of sales: Domestic sales
Shareholding	1= if Legal status shareholding company with shares trade in the stock market, 0 =otherwise
Shareholding private	1 =if Legal status shareholding company with non-traded shares or shares traded private,0= otherwise
Partnership	1=if Legal status partnership, 0= otherwise
Limited partnership	1= if Legal status limited partnership, 0 =otherwise
Sole proprietorship	1= if Legal status sole proprietorship, 0= otherwise
Other	1 =if Legal status other, 0= otherwise
No education	1= if Manager has no education, 0= otherwise
Primary	1= if Manager education- primary school (complete or not), 0= otherwise
Secondary	1= if Manager education -secondary school (complete or not), 0 =otherwise
Vocational	1= if Manager's education -vocational training, 0= otherwise
University	1= if Manager's education- some university training, 0= otherwise
Graduate	1= if Manager's education - graduate degree, o=otherwise