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Gender and microcredit in Sub-Saharan Africa: The case of Mozambican smallholder households

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Among countries in Sub-Saharan Africa, Mozambique ranks among the highest with respect to gender inequality. As genderized access to microcredit can be a driver of gender inequality in general, this paper considers how gender conditions access to microcredit and macrocredit in Mozambique. With diary data on financial activities among individuals in Mozambican smallholder households, we estimate the quantile treatment effect of being a woman on the receipt of microcredit. Methodologically, our quantile treatment framework enables an analysis of loan size based upon the actual size distribution of monetary loans among smallholder households in Mozambique. Parameter estimates reveal that being a woman in Mozambique has a positive treatment effect on two types of informal loans in the top quantiles of the loan size distribution. This suggests that in Mozambique, to the extent that loans in the top quantiles are made to entereprenuers, microcredit can potentially catalyse gender-inclusive economic growth and development.

Keywords: microcredit; Mozambique; gender inequality

Introduction

Among countries in Sub-Saharan Africa, Mozambique ranks among the lowest with respect to gender equality as measured by the Gender Development Index (Human Development Report, 2016). Out of 188 countries ranked, Mozambique ranks 181 with respect to gender development (Human Development Report, 2016). Within Sub-Saharan Africa, only Chad, Burkina Faso, Burundi, Central African Republic, Chad, Guinea, and Niger ranked lower than Mozambique. To the extent that inclusive, gender-neutral economic development and poverty reduction in Sub-Saharan Africa is favorably responsive to credit access and utilization (Agbodji et al., 2015; Koloma and Alia, 2014; Nega and Schneider, 2014; Mosley and Rock, 2004), any gender bias in the provisioning of credit in Mozambique could also be a driver of gender inequality. As rural agriculture is perhaps more dominant in the Mozambican economy relative to Sub-Saharan Africa as a whole (Cunguara, 2012), smallholder access to both microcredit in the form of small loans (Orji, 2017; Shamshad, 2015) and in the form of large loans could be an important determinant of growth, gender inequality, and

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poverty reduction (Baiyegunhi et al., 2014; Corsi and De Angelis, 2017; Hermes, 2014; Khandker, 2005; Nwosu and Orji, 2017; Sarwosri et al., 2016; Sebatta et al., 2014).

This paper considers how gender conditions access to microcredit in Mozambique. Using household-level diary data on financial activities among smallholder households in Mozambique, we estimate the treatment effect of being a woman in relation to two types of microcredit. Methodologically, we utilize a quantile treatment framework (Powell, 2010; 2017), which enables an analysis of the distribution of microcredit based upon the actual size distribution of loans among smallholder households in Mozambique. Our analysis, based upon smallholder household inflows of two types of loans, will inform the extent to which gender inequality in the distribution of microcredit, a potential driver of poverty (Bangoura et al., 2016; Giesbert and Schindler, 2012 Mosley and Rock, 2004), income inequality (Agbodji et al., 2015; Hermes, 2014), and low agricultural productivity (Akudugu, 2016; Bahta et al., 2017; Sebatta et al., 2014), exists among smalllholder households in Mozambique.

While our data are not generated from formal financial institutions that officially issue microloans, our inquiry can inform preferences and demand for microloans in smallholder households in the manner of Sagamba, Schetinin, and Yuropov (2013) and Ding and Adulai (2018). In particular, our inquiry into informal microfinance can inform formal microfinance practices (Schreiner, 2001; Siebel, 2014). In Mozambique, 2017 Global Findex data indicate that only 5 per cent of individuals in households aged 15 and above have borrowed from a formal financial institution. Thus, as the overwhelming majority of Mozambicans do not have lending relationships with financial institutions that make loans, our insights from household diary data can inform preferences for microloans that are likely to characterize demand and preferences for formal microloans.

Our inquiry makes several contributions. First, our analysis contributes to an understanding of the causes and consequences of the Mozambican economy's underperformance (Arndt et al., 2006; Cunguara, 2012; Cunguara and Hanlon, 2012) as the existence of gender inequality can inhibit economic growth (Mitra et al., 2015; Rees and Riezman, 2012; Seguino and Were, 2014). As we aim to identify the effects of gender on the provisioning of microcredit, our analysis contributes to an understanding of the gender–microcredit nexus in Sub-Saharan Africa (Agier and Szafrarz, 2013; Aterido et al., 2013; Corsi and De Angelis, 2017; Hansen and Rand, 2014; Nanziri, 2016; Nwosu and Orji; 2017), and the possible causal effects of gender on the provisioning of both large and small amounts of microcredit (Banerjee et al., 2015; Koloma and Alia, 2014). Last but not least, our findings on how gender conditions access to microcredit will provide insights important for Mozambique to achieve Aspiration 6 of the African Union Agenda 2063 (Hingston, 2016) and Goal 3 of the Millennium Development Goals (Kabeer, 2005) – gender equality and the empowerment of women – which can optimize economic growth and development (Duflo, 2012; Fofana et al., 2015; Fernandez, 2014).

The remainder of this paper is organized as follows. In the second section, we present a model. The third section describes the data and econometric framework

for evaluating how gender conditions the loan-size distribution among smallholder households in Mozambique. Section four reports estimates of treatment effects of gender on loan size from generalized quantile regression specifications for two different types of loans. The last section concludes.

Model

Suppose that for each loan made, a typical lender, i, desires to maximize expected profit conditional on loan size or $E(\pi_i \mid \Theta_i)$, where for expectation operator E, π_i is profit, and $0 \leq \Theta \leq s$ is the size of the loan that can be made from the lender's liquid net worth s, where $0 < s < \infty$. Let there be two types of borrowers in nominal categories, male and female, who can apply for loans from a typical lender. The decision to approve a loan for a given size, including no loan for $\Theta = 0$, can be viewed as a choice in which nature draws a type of borrower $t_i \in$ (M, F), where M and F indicate a set of males and females respectively, and the lender decides upon θ_i. In equilibrium, a lender observes t_i for a given loan application and chooses Θ_i, which results in an equilibrium (t^*, Θ^*), that determines equilibrium profit for the lender.

In a formal or informal market equilibrium (t^*, Θ^*), loans will have a cumulative distribution such that $Pr[\Theta \geq \theta] \geq 1 - k/\tau$, where $0 < k < \tau$ is the value of quantile τ, and the entire equilibrium distribution of loans is characterized by couplings of Θ_i and t_i, implying a joint distribution of loan size and gender. The quantile function for Θ given by $Pr[\Theta \geq \theta] \geq 1 - k/\tau$ permits a conditional quantile specification of Θ as a function of t of the general form $S_\Theta(\tau \mid t) = q(\mathbf{t}, \tau) = \mathbf{t}\beta(\tau)$ for a given quantile $\tau \in (0,1)$, where $\beta\tau$ is the effect of gender on the loan size quantile. If for a given $\tau \in (0,1)$, $\beta(\tau) \neq 0$, an implication is that gender conditions loan size. If conditioning on the set of females results in $\beta(\tau)$ being greater (less) than zero, then females are more (less) likely to be in a particular loan-size quantile.

As the conditional quantile function $S_\Theta(\tau \mid t)$ defines a distribution of loans, it also permits a definition of the size of loans made as a function of gender. In particular loans made at the lower and upper tails constitute, in a relative sense, small and large loans respectively. In the context of our inquiry, loans at the lower tails of the the conditional quantile distribution can be viewed as 'small, microcredit loans' whereas those at the upper tails can be viewed as 'large, microcredit loans'. Given policy interest in whether gender is considered for microloans/credit in developing countries, empirical estimation of $S_\Theta(\tau \mid t)$ will enable insight for this matter. In addition, estimations will also provide insight for larger microcredit loans in the upper tail; whereas, such loans may aid in financing large projects important for economic growth and development (Banerjee and Duflo, 2014; Gorodnichenko and Schnitzer, 2013).

Data and Methodology

Our data, publicly available at www.cgap.org/data, are from the World Bank's Consultative Group to Assist the Poor (CGAP) Financial Diaries with Smallholder Families. The CGAP data was compiled between June 2014 and July 2015, with enumerators visiting families every two weeks and conducting comprehensive

face-to-face interviews to track all the money flowing in and out of their households. CGAP data capture the financial and in-kind transactions of 270 small-farming households – smallholders – in Mozambique and Tanzania. While the CGAP methodology and sample size are not representative of all smallholder families in a given country, the sample of smallholder households from each country has characteristics that are broadly representative of smallholders in countries around the world (Anderson and Ahmed, 2016). Given that gender inequality in Mozambique is high, as measured by its Gender Development Index (Human Development Report, 2016) relative to Tanzania, an analysis of the gender–microcredit nexus with the two-village data – from the Rapale district of Mozambique's northern Nampula Province – can be informative of the gender–microcredit nexus for other Sub-Saharan countries in which gender inequality is high and/or approximately similar to Mozambique.

We restrict our analysis of the Mozambique CGAP data to individuals who are at least 17 years of age. As such, we follow the US convention for the minimum age at which it is legal for an individual to contract for a student loan to attend a college/university. The Higher Education Act was amended in 1992 to permit eligible students to sign promissory notes for their own federal student loans. Students born in summer months typically graduate high school at age 17, and they can legally contract for a student loan. The individual financial transactions of interest in the smallholder financial diaries are measured across eight variable codes. While there are numerous types of monetary loans reported in the CGAP data, we identified two with a sufficient number of observations that provide enough variation across the approximately 21,000 valid individual cases reported in the data. These two types of monetary loans are: (1) informal credit at a store, and (2) borrowing from friends and family. From the financial diary cash flow (cf) data, each type of loan was derived from data reported in *cf_type* or *cf_category*, scaled up by amount of Mozambican meticals reported in *value*.

Analytically, we treat microcredit as a realization from a distribution of monetary loans among smallholder households. Given a distribution of monetary loans, those at the bottom quantiles of the distribution constitute microcredit in the sense that these monetary loans are small relative to those in higher quantiles. Our notion of microcredit is therefore more general than the typical one in which microcredit is viewed as a loan valued between $100 and $500 (Karlan and Zinman, 2011), as we do not arbitrarily fix the value of microcredit, but instead allow its value to be a variable function of a monetary loan distribution. Loans in the top quantiles of the loan distribution can be viewed as large microcredit loans, as these loans are high relative to those in lower quantiles.

Given our treatment of microcredit as a realization from a distribution that is possibly conditioned on gender, we estimate the effect of gender on loans across the loan-size distribution within a quantile regression framework (Koenker and Basset, 1978). While the standard quantile regression framework is useful for estimating treatment effects with exogenous treatments, if the outcome is not orthogonal to unobservables, and covariates are added to control for the unobservables, the standard quantile estimator views all regressor covariates as treatment/policy variables,

rendering it difficult to identify the conditional treatment effect of interest (Powell, 2010). As we are interested in the treatment effect of being a woman on microcredit, and microcredit outcomes may also be a function of variables other than the explicit treatment under consideration, we estimate the effects of gender on microcredit with the Generalized Quantile Regression (GQR) estimator of Powell (2010, 2017).

For an outcome y and treatment d, with error term $u^*(\mathbf{x})$, which is a measure of observed individual proneness as a function of observable characteristics $\mathbf{x}$ that are correlated with y, a GQR specification is a nonseparable model of the form $y = q(\mathbf{d}, u^*(\mathbf{x}))$, with Structural Quantile Function (SQF) $S_y(\tau|\mathbf{d}) = q(\mathbf{d}, \tau)$, for a given quantile $\tau \in (0,1)$. An estimator of the change in the τ^{th} quantile for different values of $\mathbf{d}$, or the Quantile Treatment Effect (QTE) is $\beta(\tau)\, q = (\mathbf{d}', u^*(\mathbf{x})) - q(\mathbf{d}, u^*(\mathbf{x})) = q(\mathbf{d}', \tau) - q(\mathbf{d}, \tau)$ for $\mathbf{d}' \neq \mathbf{d}$, as $P[u^*(\mathbf{x}) \leq \tau] = \tau$. It is accounting for observed proneness with covariate vector $\mathbf{x}$ that distinguishes GQR estimates of QTEs from standard estimators of QTEs, as the SQF does not have to be altered by $\mathbf{x}$ enabling estimation of unconditional QTEs (Powell, 2016), and requires no parametric assumptions. Thus, in contrast to conditional QTE estimators, the estimated QTE from a GQR specification is relevant for an entire population of interest (Frolich and Melly, 2010).

Below, we utilize a Stata module, *GENQREG* (Baker, Powell, and Smith, 2016), which is publicly available at http://econpapers.repec.org/software/bocbocode/s458158.htm, for estimating the QTE parameters of GQR specifications of loans as a function of gender. The treatment variables in $\mathbf{d}$ is a binary indicator for whether or not the respondent in the CGAP data is a female, and was derived from financial diary data reported in data dictionary variable *M1gender*. The vector of observable characteristics $\mathbf{x}$ that are plausibly correlated with the outcome y are the respondent's age in years, and binary indicators for whether or not the respondent speaks Portuguese, can read, can write, has no formal schooling, and is married – all derived respectively from financial diary data reported in data dictionary variables *M1age*, *M1speak*, *M1read*, *M1write*, *M1highesteduc*, and *M1maritalstatus*.

Results

A description and summary of all covariates constructed from the CGAP financial diary data is reported in Table 1. Women constitute approximately 40 per cent of the sample. The average loan sizes seem low; however, if we exclude the individuals who had no borrowings, the average for *informal credit at a store*, and *borrowing from friends and family* is approximately 233 and 423 Mozambican meticals, respectively. Based upon the Mozambican metical to US dollar exchange rate on 4 June 2017, these averages are the equivalent of approximately four and seven dollars, respectively, for *informal credit at a store* and *borrowing from friends and family*.

Tables 2 and 3 report GQR parameter estimates for the treatment effect of being a woman on the amount of the loan from *informal credit at a store*, and *borrowing from friends and family* respectively. In each case, we report on 11 quantiles across the distribution, which constitutes the results from 22 GQR regressions across 19,533 observations of individuals. As the data are pooled across households, unobserved

Table 1 Covariate summary

Covariate	*Description*	*Mean*	*Standard Deviation*	*Number of Observations*
Female	Binary variable equal to One if respondent is female	0.3936	0.4883	19,581
Portuguese	Binary variable equal to One if respondent speaks Portuguese	0.7694	0.4212	19,581
Read	Binary variable equal to One if respondent can read	0.5218	0.4995	19,581
Write	Binary variable equal to One if respondent can write	0.5822	0.4932	19,581
Married	Binary variable equal to One if respondent is married	0.0697	0.2547	19,581
No school	Binary variable equal to One if respondent has no Formal schooling	0.0509	0.2198	19,581
Age	Respondent's age	40.13	12.96	19,581
Informal credit at a store	Amount of informal credit at a store (Mozambican Meticals)	0.9405	30.43	19,553
Borrowing from friends and family	Amount of borrowing from friends and family (Mozambican meticals)	4.25	91.73	19,553

Source: Consultative Group to Assist the Poor (CGAP) Financial Diaries with Smallholder Households, Mozambique 2014–2015, World Bank Group.

household level heterogeneity could lead to biased parameter estimates. However a GQR specification allows QTEs to vary based on both observed and unobserved individual heterogeneity or proneness (Powell, 2017) – which we control for in our specifications.

The general patterns of the estimated unconditional QTEs for both types of microcredit are the same in Tables 2 and 3. Being a woman has the effect of reducing the size of the loan starting in the $\tau = .05$ quantile up until $\tau = .30$, and increasing the size of the loan starting in the $\tau = .40$ quantile. Across all quantiles the estimated conditional QTEs are statistically significant and, relative to the mean value of the loans across all observations, seem to be of practical significance. An example of practical significance in this context can be seen by considering $\tau = .30$ conditional on QTE *borrowing from frineds and family* in Table 3. The estimated QTE is more than 100 percent of the mean value of this category of loans.

In general, the GQR estimates in Tables 2 and 3 suggest that being a woman in a Mozambican smallholder household has a negative treatment effect on small microcredit loans and a positive treatment effect on large microcredit loans. At the low quantiles, where loans are relatively smaller, being a woman results in even

Table 2 Quantile treatment effect parameter estimates: gender and informal credit at a store in Mozambique

Quantile:	$\tau = .05$	$\tau = .10$	$\tau = .20$	$\tau = .30$	$\tau = .40$	$\tau = .50$	$\tau = .60$	$\tau = .70$	$\tau = .80$	$\tau = .90$	$\tau = .95$
	−.500 (.0001)[a]	−.500 (.0001)[a]	−.500 (.0001)[a]	−5.500 (.0001)[a]	55.500 (.0001)[a]	50.500 (.0001)[a]	50.500 (.0001)[a]	50.500 (.0001)[a]	50.500 (.7390)[a]	55.500 (.0001)[a]	50.500 (.0001)[a]
Number of Observations	19,553	19,553	19,553	19,553	19,553	19,553	19,553	19,553	19,553	19,553	19,553

Notes: Approximate p-values are in parentheses. For all GQR specification, proneness is a function of the respondent's age, marital status, whether or not formal schooling has been completed, reading and writing capability, and whether or not Portuguese is spoken.

[a] Significant at the .01 level.

Table 3 Quantile treatment effect parameter estimates: gender and borrowing from family and friends in Mozambique

Quantile:	$\tau = .05$	$\tau = .10$	$\tau = .20$	$\tau = .30$	$\tau = .40$	$\tau = .50$	$\tau = .60$	$\tau = .70$	$\tau = .80$	$\tau = .90$	$\tau = .95$
	−5.500 (.0001)[a]	−5.500 (.0001)[a]	−5.500 (.0001)[a]	−5.500 (.0001)[a]	3.00 (.0001)[a]	.500 (.0001)[a]	3.00 (.0001)[a]	3.00 (.0001)[a]	.500 (.0001)[a]	3.00 (.0001)[a]	3.00 (.0001)[a]
Number of Observations	19,553	19,553	19,553	19,553	19,553	19,553	19,553	19,553	19,553	19,553	19,553

Notes: Approximate p-values are in parentheses. For all GQR specifications, proneness is a function of the respondent's age, marital status, whether or not formal schooling has been completed, reading and writing capability, and whether or not Portuguese is spoken.

[a] Significant at the .01 level.

smaller loans, suggesting that relative to men, women are less likely to receive small microcredit loans. For high quantiles where loans are relatively larger, being a woman results in even larger loans, suggesting that relative to men, women are more likely to receive large microcredit loans. As for rationalizing these different effects for being a woman, as the CGAP data do not report what loans are utilized for, we can only offer measured and conditional speculation. It is conceivable that at the low quantiles, the loans are for smoothing shocks to household consumption (Alvi and Dendir, 2009; Schindler, 2010). Reasoning similarly, to the extent that medium-scale business enterprises in Mozamique are disproportionately female, as for example in Kenya (Kusi, Opata and Narh, 2015), loans at the upper quantiles are likely microloans for business. In this last instance, our results are supportive of Mozambican female entrepreneurs not being discriminated against in the market for loans.

Conclusion

This paper considers how gender conditions access to microcredit in Mozambique. With diary data on financial activities among individuals in Mozambican smallholder households, we estimated the unconditional quantile treatment effect of being a woman on the receipt of large and small microcredit loans, based upon two types of informal borrowings. Methodologically, we adopted a QTE framework, which enables an analysis of loan size based upon the actual size distribution of monetary loans among smallholder households in Mozambique. GQR parameter estimates of unconditional QTEs reveal that being a woman in a Mozambican smallholder household has a positive treatment effect on loans in both top quantiles of the loan size distribution for both types of loans. In particular, we find that relative to men, women are more likely to receive large microcredit loans. To the extent that loans at the top quantiles are made to and for business enterprises, our results support a case that Mozabmican female entrepreneurs do not face discrimination in the market for microloans.

With respect to limitations, while our findings suggest that in Mozambique women face no barriers to the receipt of microloans, the results are based upon informal borrowings outside of official formal institutions, and may not inform the efficacy of actual financial institutions in Sub-Saharan Africa designed for making microloans. However, to the extent that informal lenders have considerable experience and knowledge about microloans that can finance medium- to large-scale businesses (Aryeetey, 2005; Steel et al., 1997), our results suggest that official financial institutions could learn from informal lenders about how to provision microloans to women. Thus, our findings may be useful for strategies that aim to integrate informal lending institutions into formal institutions (Asongu, 2015), so as to promote gender equality in lending in Sub-Saharan Africa.

As for policy implications, our results suggest that if female barriers to credit constrain economic growth, say as result of their impact on the formation of women-owned firms (Belwal, Tamiru, and Singh, 2012; Elu, Bussey, and Price, 2014), any underperformance of the Mozambican economy is a result of women

in smallholder households facing barriers to microcredit – at least in informal financial markets. In this context, integration and/or information sharing between formal and informal financial institutions in Mozambique could result in higher levels of female empowerment (Duflo, 2012; Fofana et al., 2015; Fernandez, 2014), which could catalyse more economic growth and development in Mozambique. Lastly, our results suggest that informal lenders in Mozambique have contributed to Mozambique's achieving Aspiration 6 of African Union Agenda 2063 and Goal 3 of the Millennium Development Goals – gender equality and the empowerment of women. To the extent that formal financial institutions in Mozambique are unsure of or ignorant of policy schemes that promote gender equality and the empowerment of women, our findings suggest that partnerships between formal and informal lenders could be beneficial in Mozambique optimally achieving Aspiration 6 of the African Union agenda and Goal 3 of the Millennium Development Goals.

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