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## Increasing Gender Equity in the Nigerian Microfinance Market

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### Abstract

Female microcredit recipients are more likely to productively apply loans and less likely to default. In the Nigerian market, however, studies have revealed stark gender disparities in both loan approval rates and mean loan amount. This paper uses reported data from FY2015-FY2019 from all licensed microfinance institutions (MFIs) to assess the importance of four structural components of MFIs (total asset value, the existence of nonfinancial women's empowerment services, the percentage of female loan officers, and the percentage of female managers) in lending to women. Data limitations resulted in significant unexplained variance in all statistical models, while also revealing few relationships between the variables and the percent of female borrowers in an institution's portfolio. This work intended to offer recommendations to Nigeria's regulators and MFIs, but concludes that recommendations are not feasible from aggregated data; rather they must be derived from local studies wherein subtle influences may be accounted for.

### Keywords

Microfinance, Nigeria, Female Lending, Women's Empowerment, Sustainability

### Disciplines

Business

INCREASING GENDER EQUITY IN THE NIGERIAN MICROFINANCE MARKET

By

Geeta Minocha

An Undergraduate Thesis submitted in partial fulfillment of the requirements for the

JOSEPH WHARTON SCHOLARS

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MAY 2019

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## INTRODUCTION

### Overview of Microfinance and Female-Focused Lending

Microfinance, or the giving of financial services to constituencies that would otherwise not have access to them, has long been considered critical for economic development. Its broad goals are as follows: 1) Foster a “saving” culture within a community by offering credit access as incentive; 2) Increase financial inclusion; 3) Improve overall societal welfare vis à vis sustainable micro, small, and medium enterprises (MSMEs) created or supported through microfinance services; and 4) Empower traditionally marginalized groups by making them legitimate market participants in health care, education, etc. Whether these goals are definitively met has been debated for decades. Several studies report substantial improvements in the size and diversification of annual incomes of those who have accessed microcredit loans (Mosley 2010; Nawaz 2010; etc.), while others highlight the advanced standard of living for recipient communities (Littlefield, Murdoch, and Hashemi 2003). Some are unable to see past the intractable cycles of debt many clients are subjected to, with one academic labelling microfinance a “development fad... based on simple but superficial poverty relief” (Ellerman 2007).

To some extent, this research paper will further qualify this debate. In particular, it will broadly assess whether the aforementioned goals are being met for women. Many microfinance institutions (MFIs) have adopted a female-focused lending model in recent decades. The results, though somewhat controversial, have indicated that female entrepreneurs, despite generally incurring more obstacles, are both far less likely to default than men and more likely to apply their loans towards sustainable businesses that improve the standard of living for their

communities. Meanwhile, rates of expenditure on “temptation goods” (tobacco, alcohol, gambling, etc.) are far lower (Banerjee, Duflo, Glennester, and Kinnan 2013).

D’Espallier, Guerin, and Mersland (2011) collected data from MFIs in several countries and concluded that a greater percentage of women in institutional portfolios correlated with lower portfolio risk, fewer write-offs, and fewer provisions. A subsequent study, also using aggregate global data, suggested that a female-focused lending model may not legitimately improve an institution’s overall financial performance; more women in a portfolio were associated with higher costs. Yet the authors qualified this result by noting that MFIs typically engage with women via group-lending systems, a costlier administrative method, and definitively state that “a focus on women significantly improves repayment” (D’Espallier, Guerin, and Mersland 2013). Group-lending is vital in contexts with very poor, or very marginalized, potential clients (Mersland and Strom 2009); it is thus typically necessary in the female-focused model. Data largely supports the notion that, despite related costs, female-focused lending is not simply a “feel-good”, social impact talking point for microfinance investors, but a legitimate best practice for MFIs given their missions.

### **Classifications of Institutions and Credit**

“Microcredit” has become something of a catchall term. Even Muhammad Yunus (2003), the pioneering founder of Grameen Bank, has acknowledged that its application in development work becomes tricky when one fails to distinguish between the types of credit available. He offers ten broad classifications:

- Traditional informal microcredit (ex: loans from friends)
- Microcredit based on traditional informal groups
- Activity-based microcredit (ex: agricultural credit)

- Rural credit via specialized banks
- Cooperative microcredit (ex: credit unions)
- Consumer microcredit
- Microcredit based on bank-NGO partnerships
- “Grameencredit”
- NGO microcredit
- Non-NGO, non-collateralized microcredit

For the purposes of this research, we may reduce this list to rural credit via specialized banks, consumer microcredit, microcredit based on bank-NGO partnerships, and NGO microcredit when attempting to categorize MFIs. To these institutions come borrowers looking for one of three types of credit: Production credit, consumption credit, and security/insurance credit (Nourse 2001).

Production credit is invested into a business in the interests of increasing production capacity and hence, income. Meanwhile, consumption credit is typically a large, lump-sum payment for immediate needs, such as medical bills or marriage expenses. It allows households to survive times of financial hardship. Finally, insurance credit allows clients to mitigate risks that may accompany new business ventures, natural disasters, etc. One may be tempted to think that each credit classification is associated with its own unique borrower profile, but this is not the case. Consumption and production expenses are often inseparable for operators of MSMEs (Nourse 2001).

### **Institutional Variances in Microfinance**

Each MFI operates with a different business model. One distinction of note is the for-profit versus nonprofit MFI, with the former operating to offer a positive return to its

shareholders. These for-profit models are traditionally associated with higher interest rates for borrowers (Roberts 2013). An institution's profit orientation has incredible implications for its clientele and its impacts on community sustainability. For example, Navajas et al. (2000), Schreiner (2002), Rhyne (1998), and Von Pischke (1998) each point to the higher transactional costs associated with small loans. In theory, for-profit MFIs will be unwilling to engage with very poor clients or poor-performing MSMEs (the crux of the microfinance mission) in order to see better financial performance. Conversely, some data suggests that for-profit orientation leads to a greater level of client outreach; more women may be informed of credit opportunities, for instance, or more of the very poor (Quayes 2011). In addition to basic structural differences, each institution faces unique cultural and regulatory environments in which it must operate. To account for operational differences that may occur at the most local levels, no international governing body has yet crafted universal standards for applicant screenings or accountability methods. Central banks will prepare basic rules and proffer suggestions related to existing consumer protection and fraud laws, but ultimately each MFI operates with a great deal of autonomy.

### **The Nigerian Microfinance Market**

Several small-scale studies have been done to determine gendered rates of microloan approval in Nigerian states. For example, one study by Ameh and Andrew reveals that in Benu State, Nigeria, rice farmers typically targeted by MFIs are heavily limited in their credit access based on several stratifications, including marital status, age, annual income, and gender. Here, the vast majority- over 70%- of all approved loans were for males. Further indication of disparate loan approval rates comes from surveys of microcredit clients. Nigerian female entrepreneurs are more likely than their male counterparts to perceive their social standing as potentially beneficial

to their loan access and to their relationships with loan officers in MFIs. This would imply an awareness of potential bias from loan officers, whether pro-women or otherwise, that may possibly be a result of firsthand experience. In a similar vein, Ugwuja and Ngweze discovered a significant difference in the mean loan amount accessed by men as compared with women, with men accessing far greater amounts.

An attempt has been made at understanding the relative gender disparities in Nigerian microfinance. Umemezia and Osifo have determined that women in the country face unique challenges to obtaining microfinance credit. The reasons they identify are: A lack of awareness of credit opportunities, the inability to find a guarantor, and a potential bias amongst loan officers regarding a woman's ability to meet the terms of a loan. A high default rate within a specific demographic would naturally require a lending institution to assess more critically loan applications from that demographic. For women, a high default rate would likely be attributed to cultural norms which prevent local consumers from taking advantage of a woman's venture, and thus one might say that Nigerian MFIs are actually deliberately limiting loans for women as a means of ensuring their long-term sustainability. Yet deliberate action would suggest that data has prompted loan officers to further scrutinize female applications, and this cannot be the case. The external ecosystem of the Nigerian microfinance industry is very comparable to those of other nations, and particularly where it concerns female-focused lending. A Nigerian woman is 16% less likely to default on a loan than a Nigerian man (Sayuti and Kabiru 2017). Female-owned and operated businesses are on the rise there, just as they are in almost every other nation (Umemezia & Osifo 2018).

A key difference between the sexes may explain the disparate loan approval rates from MFIs: On the whole, Nigerian men own more assets than women, according to Ugwuja and Ngweze.

More property equates to more collateral with which to obtain credit, including loans from MFIs. Of course, by nature of their value proposition, MFIs ought not to be making collateral a significant factor in the lending process; they are meant to act as resources for the underserved, especially the very poor that have traditionally lacked collateral. Yet perhaps loan officers have been doing just that, though unconsciously.

### **QUESTION**

Given the aforementioned data, I intend to answer the following question:

What can Nigeria do to ensure more gender-equitable lending across its microfinance market?

### **HYPOTHESIS**

A woman's ability to access a loan, and the amount that she is able to obtain, will be some consequence of the institution's criteria for credit-worthiness, such as ownership of collateral, *as well as* subtle factors related to the institution's structure, such as its mission, staffer composition, and additional community services offered. The credit-worthiness criteria would to an extent impact the independent variables of this study, certain components of institutional structure; they are endogenous variables. For example, an MFI that excludes the very poor from its lending model is more likely to have a mission directly related to economic development, since it is easier for clients who are not experiencing abject poverty to apply their loans to economic and sustainable enterprises.

Credit-worthiness criteria are integral to the lending model of an MFI, and are thus not something that necessarily can or should be regulated by state governments. This paper will focus exclusively on institutional structures as determinants of equitable lending, ones which may be feasibly impacted by state pressures. Accordingly, this research is founded on a

hypothesis that state or multilateral efforts to impact institutional structure will be effective in improving gender equity across the Nigerian microfinance market.

## **RESEARCH METHODOLOGY**

### **Assumptions**

The analytical methods employed are based off two key assumptions, and so should be understood as being only blunt instruments in an analysis of the Nigerian microfinance market. First, an “equitable” lending portfolio is simplified to mean one that is comprised of at least 50% female borrowers. This figure reflects the total proportion of women in Nigeria between 15 and 64, 49.75%, then rounded up to 50% for simplification purposes (“Nigeria” 2018). The Central Bank of Nigeria requires microfinance clients to be between age 18 and 60, but the census data only offers population statistics for the 15-64 demographic, with no way to determine how many from that number fall within the 15-17 and 61-64 ranges. Given the inability to account for this, this analysis assumes the 49.75% to be adequately reflective of the female proportion of Nigerians 18-60, and hence uses 50% as a threshold for equity when assessing portfolios.

Second, this paper assumes a contemporary analysis to include FY2015-2019. The microfinance industry has changed dramatically in the last several decades, and indeed, in the last few years. The changes include shifts in lending models, credit delivery and monitoring channels, financing, etc. This period was chosen to avoid the industrial tumult during and immediately after the international financial crisis, when MFIs attempted radical changes in their scale and funding structure to offset liability shocks and decreased access to international capital markets (Di Bella 2011). Some of these institutional changes were retained, while others were redacted as the recovery period began. This paper assumes FY2015 to be far enough removed from the financial crisis so as to reflect a general stability and permanence in institutional

structures. Sample size was an additional justification for beginning the study with FY2015, for a later start would have resulted in statistically insignificant samples ( $n < 170$  for an international industry analysis,  $n < 30$  for an African industry analysis). To this end, the selected period contains some data from institutions that failed to report portfolio or structural data every year in the period, either because they were founded or failed within that period. For example, an institution may have been in operation before FY2015 and then failed in FY2017, thereby contributing two years' worth of data to the studied sample. Alternatively, an institution may have started in FY2016, and then contributed four years' worth of data to the sample. Some of the analysis may hence be confounded by the inclusion of institutions that represent fading trends from the pre-contemporary period; for instance, a study of trends in stated institutional mission may be confounded if some reported data comes from MFIs that operated predominantly pre-FY2015, and thus may have been impacted by starkly different trends regarding stated missions.

### **Data Collection and Variables of Interest**

Data was obtained from the Microfinance Information Exchange (MIX) Market, a database that offers institutional data from every licensed MFI in the world. Its data spans twenty years, beginning in FY1999. In addition to basic metrics found in annual reports, such as debt-to-equity ratios, expenses, and deposits, the dataset includes self-reported data on operations and management, such as number of office branches, types of delivery channels utilized (mobile banking, roving agents, etc.), and social missions. For this research, five variables from the MIX Market database are analyzed:

- Assets
- Offering of nonfinancial women's empowerment services
- Percent of female loan officers

- Percent of female managers
- Percent of female borrowers

Organizational capacity is an important predictor variable to consider. Its definition varies across sectors, adjusting with the profit orientation of the organization, but the RAND Institute suggests this compelling, albeit generalized, explanation: The culture, communication, leadership, strategy, structure, skills, human capital, and accountability within a firm that combine and coordinate to deliver services. While an institution's resources are key to obtaining capacity, other components are critical to achieving an organizational mission, such as strong institutional values. A report from the Institute notes, "Organizations typically do not develop capacity for capacity's sake. They are responding to internal and external pressures to improve performance or change working practices" (Cox et al. 2018). MFIs may face varying degrees of pressure from community, national, and even international entities depending on their size, pressures which may force them to increase lending to women. Outside of these pressures, enough capacity can give an MFI the legal authority to serve as a legitimate financial intermediary, while lack thereof can inhibit it from accessing more clients, developing innovative financial products, training staff, and implementing effective credit delivery systems (Llanto et al. 1997). Thus, capacity can be seen as an independent variable influencing how many women may obtain credit because of both intangible (external demands regarding gendered lending) and tangible forces (the organization's practical ability to lend to women given its resources).

The MIX Market database included many potential proxies for organizational capacity. *Profit* was considered, since an organization requires a profit to sustain and diversify operations. Yet this figure is difficult to interpret in the case of profit drivers; there is no way to tell, for instance, whether the figure was determined by changes in operations or finances. Similarly,

*return on assets* and *return on equity* were assessed, but the former is indicative of the institution's management of assets, while the latter is indicative of profitability. *Return on assets* is most effective as a measure of organizational performance; thus, a low ROA would not necessarily indicate low capacity, but rather an ineffective organizational strategy. *Return on equity* is particularly ambiguous, as it fails to inform about the risks a firm may have taken to generate the figure; that is, one is unable to make inferences about the mode utilized by the MFI. Each of these two metrics by itself fails to fully capture the external and internal components that comprise capacity.

*Total gross loan portfolio*, *number of borrowers*, and *borrowers per loan officer* were also considered for the proxy role for organizational capacity as each is a partial estimate of the organization's internal abilities. *Borrowers per loan officer* did not seem to fully capture the presence of external pressures; it is possible, for instance, that an organization with several investors may serve more clients, thus increasing its value for this variable. It would also be unfair to call this variable a strong measure of the organization's efficiency, as it fails to take into account the administrative work the organization must do for each client; *borrowers per staff member* would be a more accurate measure, but, again, this number may increase only because an organization serves more clients proportionally to its investor backing. Similarly, *number of borrowers* may be significantly confounded by a dearth or surplus of alternative credit institutions in the region from which an institution is operating. *Total gross loan portfolio* reflects the institution's ability to lend, but is a metric that does not account for the interest receivable, an important future resource that the organization may leverage in operations. *Assets*, meanwhile, represent the whole of the organization's resources. This in turn encompasses the organization's liabilities to other entities and its capital resources. Liabilities may be indicative of

how much external pressure the organization is facing, while the capital resources are somewhat reflective, albeit incomplete, measures of the firm's internal, concrete capabilities. This was the only variable containing both the vital external and internal elements of organizational capacity.

*Offering of nonfinancial women's empowerment services* could refer to a number of things. An MFI could offer, either directly or through partnerships with other organizations, income-generating skill development, such as training in poultry rearing or very basic product marketing. More commonly, these empowerment services are socially-based, such as food or health care subsidies and civil rights awareness campaigns. All services are delivered based on the premise that sustainable lending requires a comprehensive improvement in the lives of clients. A client in poor health will be unable to effectively manage an enterprise or monitor their repayments, for instance, so an MFI offering basic health services to clientele is to an extent further equipping them for success in both business and livelihood development. The existence of such nonfinancial empowerment services would presumably have a twofold effect on lending to women. First, it would indicate an organization-wide commitment to gender equity, one that would permeate downstream into the final lending decisions of loan officers. Second, awareness of the nonfinancial services would help women feel more deserving of credit access, and would increase their awareness of the financial services available. This would increase the number of loan applications from women. Likewise, higher values for *percent of female loan officers* and *percent of female managers* would encourage women to take an MFI's services, and may increase the amount of capital they are able to access due to homophily effects. *Percent of female borrowers*, or the number of active female borrowers over the total number of active borrowers, serves as the dependent variable in this research.

## Foundational Models

Basic regression models were created in order to first identify the global industry trends between FY2015 and FY2019. These were simple least-squares linear regression models with *percent of female borrowers* plotted against each of *fiscal year*, *assets*, *percent of female loan officers*, *percent of female managers*, and *offering of nonfinancial women's empowerment services*. A multivariate regression was then run using all of the variables to obtain a better fit. The purpose of these models was only to determine basic correlational relationships between variables, not to make determinations about direct causality; the former will suffice in crafting actionable recommendations for MFIs. The same regression models were then run using only data from Nigerian institutions in order to identify country-specific trends. However, the number of reported data points about supplementary services and staff composition was extremely small, making the results from models for *percent of female loan officers*, *percent of female managers*, and *offering of nonfinancial women's empowerment services* statistically insignificant ( $n = 25$ ,  $26$ , and  $4$ , respectively). The multivariate was especially paltry, with  $n = 4$ .

Regressions were then run to include all reported data from the African continent to obtain a more statistically significant sample size from which to develop recommendations. The nations of the continent are not homogenous by any means. However, the microfinance sectors are similar enough across borders because: 1) Infrastructure limitations inhibit many potential clients from accessing an MFI, and also hinder an MFI's ability to deliver services to existing clients; and 2) Weak institutions make regulatory enforcement of MFIs rare, and enforcement of contracts between partner organizations and clients difficult. The comparable operating environments of MFIs all over Africa have led many institutions to experience the same problems and successes. For example, issues of portfolio management (there are high portfolio-

at-risk percentages<sup>1</sup> across the region), internal controls (fund misappropriation is common), and human resources (staffers typically lack comprehensive technical training or experience) are universal (“Microfinance in Africa” 2013). Consequently, while each institution will of course be subject to subtle differences in regulatory enforcement, clientele, etc., it is not imprudent to use models with data from throughout the continent as a basis from which to draw recommendations for the Nigerian market.

With the exception of regressions examining relationships over time, each model encompasses all annual reports filed by every institution in the respective market- that is, each model utilized a complete sample. This includes reports from institutions which may not have reported for every year in the FY2015-FY2019 period because they began or ended operations within that period. This was essential in order to account for the dynamic state of the microfinance sector; its volatile nature means that many fail, while promises of high interest rates continue to encourage investors to back new entities. This dynamism is especially present in the Nigerian market, where the Central Bank’s negligible minimum capital requirement for MFIs has resulted in a low barrier to entry. A global or regional analysis must hence necessarily encompass all institutions, regardless of lifespan, so as to accurately translate findings for the Nigerian market specifically. Moreover, some institutions do not consistently report to a Central Bank and are still able to maintain operations due to a lack of strong institutions and enforcement mechanisms in their host country. This is also the case in Nigeria, where the Central Bank has listed this as one of the market’s primary causes of concern in a recent report (“Nigeria’s Microfinance Bank Sector” 2017). Accordingly, it is likely that all regression models include at

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<sup>1</sup> The percentage of the total loan portfolio that is at risk.

least some data points from institutions that failed to report consistently across the studied period but are still in operation.

The purpose of this research was to identify, independent of the overall success of individual institutions, how MFIs may make their portfolios more equal along gendered lines. As a result, there was no need to account for institutional failure via dummy variables in the models. In addition to offering information that is out of the intended scope of this research, a dummy variable would improperly represent the financial distress of a bank. There is no truly sound way to identify a timeline of distress through this variable, for the dates of official institutional failure are largely unavailable. One could presumably infer from annual reporting data when an institution went under- an MFI with a report for FY2016 but no more after can be assumed to have failed some time in FY2017, for instance- but this is not a very accurate estimate, especially given that many institutions have simply failed to report but are still in existence as discussed previously. The continued operations of these institutions itself requires all data points from the period to be included, as many of these data points will represent MFIs still using the same structural components for the delivery of its services.

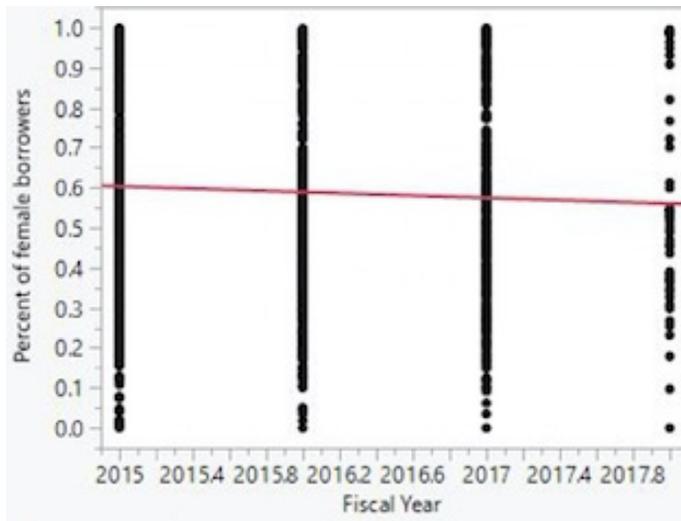
An additional problem with including a dummy variable to represent an MFI's lifespan is that the data offers no way to identify institutions with fluctuating financial health. An institution may have begun the period as healthy, then become distressed. Alternatively, it could have started as a distressed institution, only to recover. A dummy variable would improperly express these cases, as there is no way to determine what may have pushed an MFI towards bankruptcy, or what may have prevented it. For example, a distressed institution may have been saved by financing from an angel investor instead of by effective internal changes related to the structural variables of interest here; using a dummy variable to identify it as healthy would inaccurately tie

this health to the studied variables. Conversely, a stable institution with strong operational practices may have experienced sudden financial hardship due to a demand shock. There is also the possibility that an institution experienced several bouts of distress over time. In this case, the presumed dummy variable would only account for the distress at the very end of its life, or at the end of its annual reporting. If it is true that the financial state of the firm influences the extent to which women are lent to, then an MFI's portfolio is likely to be significantly impacted by multiple periods of financial distress in a way that would not be accounted for in a new statistical model.

While a dummy variable was not needed to account for institutional health/lifespan, one was used in the regressions of *percent of female borrowers* against *offering of nonfinancial women's empowerment service* to reflect the binary nature of the variable. The only other key adjustment of note is the elimination of all data points representing a 100% female borrower value (e.g. the regression's range for *percent of female borrowers* spanned .00-.99), something done across models. Some institutions lend exclusively to women as part of their operational model, and so these values would confound the relationship between the percent of female borrowers and the other variables.

## DATA ANALYSIS

### a. Relationship Between Percent of Female Borrowers and Time, Global

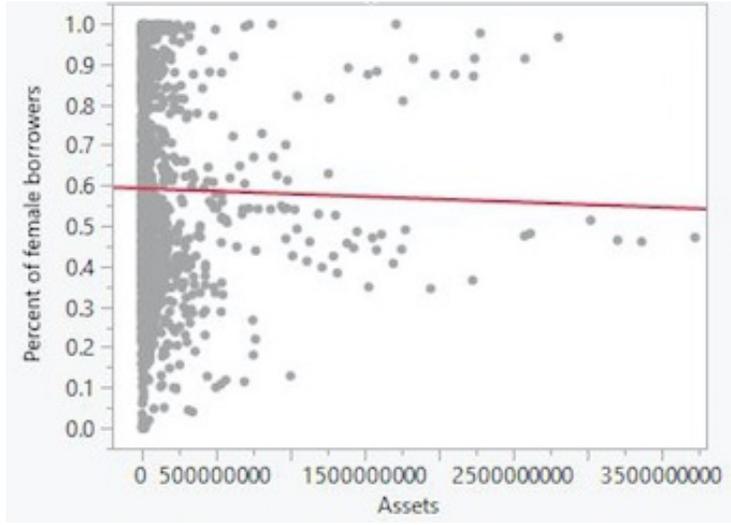


Percent of female borrowers =  $29.4011226 - .0142918 \times \text{Fiscal year}$

RSquare = .002535 | Root Mean Square Error = .249555 | Observations = 1775

This model yielded a statistically significant p-value and f-value. Thus, despite the low correlation, one may assume that the percent of female borrowers per portfolio likely has experienced a significant decline internationally in the contemporary period. The mean percentage is 58.9971, still above the threshold this paper defines as “equitable”. Yet the decline is still noteworthy when considering the tendency for female clients to apply their credit to more sustainable enterprises, and the lower default rate for women across markets. One may argue that a truly “equitable” portfolio is one that accounts for these differences, lending more to a demographic that aligns with the ethos of the operation and contributes to its sustainability. Regardless of how one chooses to define “gender equity” in a lending portfolio, this model confirms the foundations of this research. Additionally, it offers reason for caution for microfinance institutions worldwide, since this downward trend in the percent of female borrowers per portfolio is global.

## b. Relationship Between Percent of Female Borrowers and Assets, Global

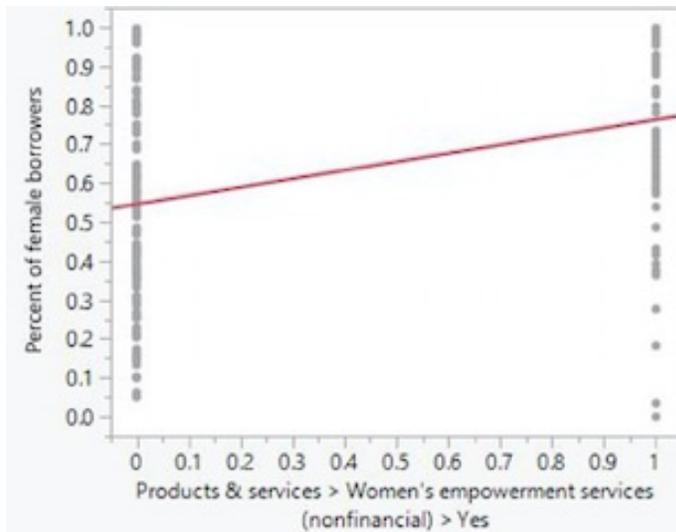


$$\text{Percent of female borrowers} = .5925699 - 1.328e^{-11} * \text{Assets}$$

$$\text{RSquare} = .000307 \mid \text{Root Mean Square Error} = .249568 \mid \text{Observations} = 1744$$

A crude interpretation of this model is that it indicates a negative linear trend between the variables. One possible explanation for this is an increasing institutional focus on bottom-line as total asset value increases, likely due to increasing investor pressures. This could indirectly impact lending to women because of the increased expenditure required to recruit and maintain them as clients. However, this explanation is not without fault; the Lack of Fit report for this model revealed an extremely unfit model, with the *Prob > F* and the *F Ratio* values unreportable due to their negligible size. The RSquare is notably insignificant. Further, the Analysis of Variance (ANOVA) table offered an *F Ratio* of .5357, indicating that within-group variance of the sample is larger than the between-group variance, or that there is a small population effect. As a result, one is unable to adequately conclude anything about this relationship.

**c. Relationship Between Percent of Female Borrowers and Women's Empowerment Services (Nonfinancial), Global**

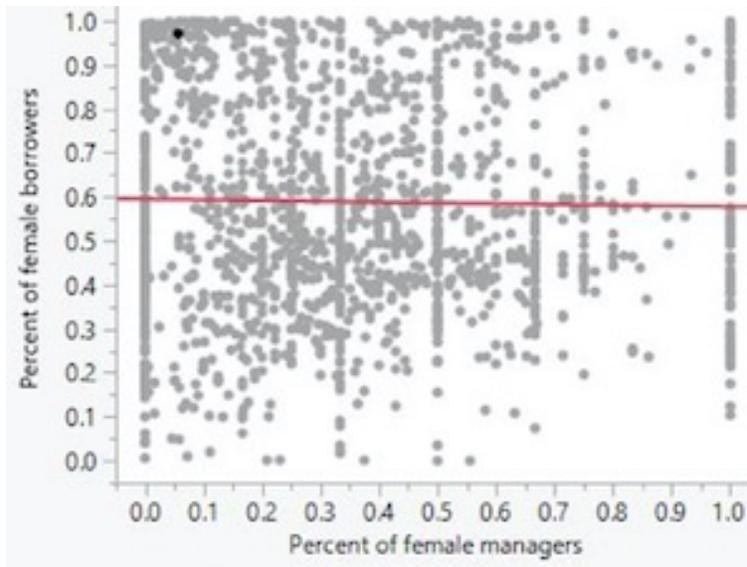


Percent of female borrowers =  $.5455864 + .2175591 * \text{Women's empowerment services (nonfinancial) > Yes}$

RSquare = .148668 | Root Mean Square Error = .254113 | Observations = 202

This model shows a weak, positive correlation (.3855) between the variables: More of the institutions that offered nonfinancial women's empowerment services had high percentages of female borrowers in their portfolios. The Summary of Fit and ANOVA tables revealed a statistically significant p-value and f-value. It is certainly possible that once an institution begins offering these empowerment services, its *percent of female borrowers* value will increase, perhaps due to a cultural shift within the organization that then permeates to the lending model. Other possible explanations of this relationship include the existing empowerment services reflecting: An existing organizational commitment to lend to women; Organizational capacity that indirectly allows for greater outreach to women; An operating environment with a significantly higher proportion of women. Such alternative explanations emphasize the endogenous nature of this study's variables of interest.

**d. Relationship Between Percent of Female Borrowers and Percent of Female Managers, Global**

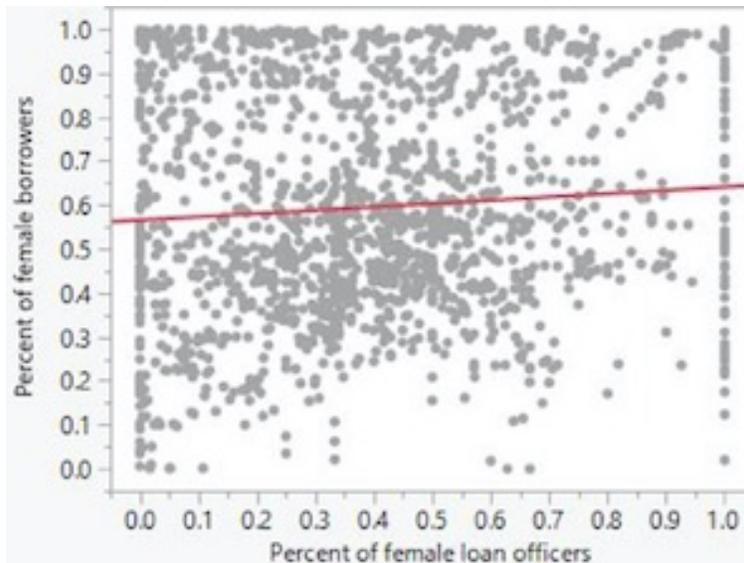


Percent of female borrowers =  $.5954335 - .0175181 * \text{Percent of female managers}$

RSquare =  $.000376$  | Root Mean Square Error =  $.249303$  | Observations = 1602

One immediately notes the incredibly insignificant correlation between the variables in this model, displayed via the RSquare value. Here again the ANOVA table revealed an *F Ratio* of less than 1 ( $.6022$ ), suggesting great variance within population groups relative to between-group variance. The statistically insignificant p-value and f-value further indicate the need to ignore the results of this model.

e. **Relationship Between Percent of Female Borrowers and Percent of Female Loan Officers, Global**

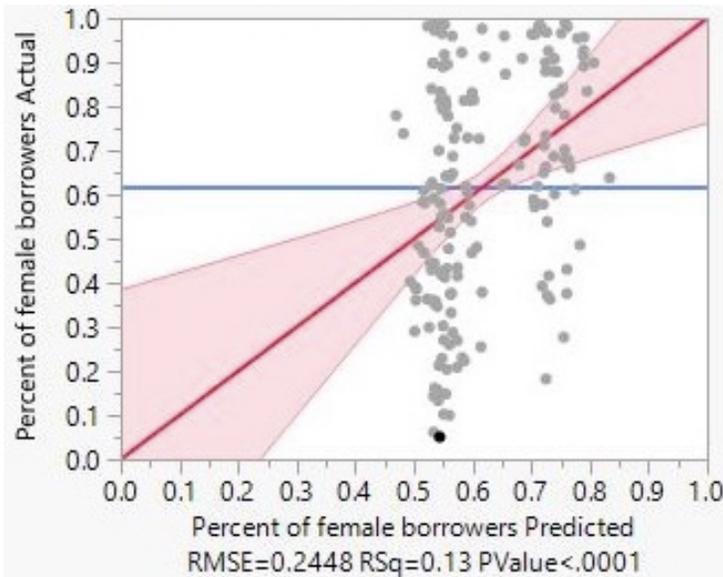


Percent of female borrowers =  $.5654101 + .0753152 * \text{Percent of female loan officers}$

RSquare = .006308 | Root Mean Square Error = .248798 | Observations = 1578

This model yielded a statistically significant p-value and f-value despite the low RSquare; this may be the result of the large sample size of 1,578. However, it is possible that this slightly positive relationship is above chance, and in this case one may attribute it to the effects of representation. That is, engaging with women who work within an MFI may encourage other women to seek its financial services. In turn, homophily biases may cause female loan officers to approve more loans for female clients. The surprising results from all baseline models, and particularly the low RSquare values, suggested that the models must be combined into a multivariate model to obtain better variable fit. Several multiple regression models were created to determine each variable's significance, with each plotting the *percent of female borrowers* against two or more of the studied variables. In each subsequent model, the correlation increased. The best-fit multivariate model thus contained all four of the independent variables.

**f. Relationship Between Percent of Female Borrowers, Assets, Women’s Empowerment Services (Nonfinancial), Percent of Female Managers, and Percent of Female Loan Officers, Global**



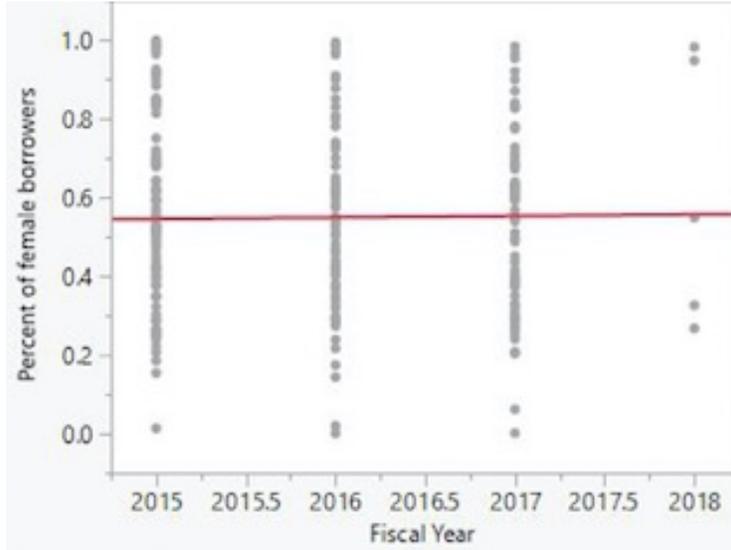
RSquare = .131088 | Root Mean Square Error = .24482 | Observations = 173

Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	0.533391	0.033764	15.80	<.0001*
Assets	2.943e-11	4.8e-11	0.61	0.5410
Products & services > Women's empowerment services (nonfinancial) > Yes	0.1944947	0.040494	4.80	<.0001*
Percent of female loan officers	-0.103076	0.086644	-1.19	0.2359
Percent of female managers	0.1759927	0.101434	1.74	0.0846

Creating a multivariate model for the global data resulted in a better fit, evidenced by the higher RSquare value. The model supports the earlier simple linear regression model plotting *percent of female borrowers* against *offering of nonfinancial women’s empowerment services*, for there is again a statistically significant p-value; this relationship is likely above chance. Thus, with caution, one may conclude that a relationship does exist. However, the p-values of the other three variables are not statistically significant. One problem with the model might be the small sample size; even using the global data, there were only 173 observations. This is sufficient, but

certainly not ideal. Additionally, there is likely an issue of multicollinearity skewing the results, given that the independent variables are endogenous. The endogeneity may have increased the standard errors of each coefficient. So, one is still unable to make any conclusive judgments about the relationship between *percent of female borrowers* and the other three variables. New regressions were the created using data from the African continent in the hopes of identifying regional market trends from which to create recommendations.

**g. Relationship Between Percent of Female Borrowers and Time, Africa**



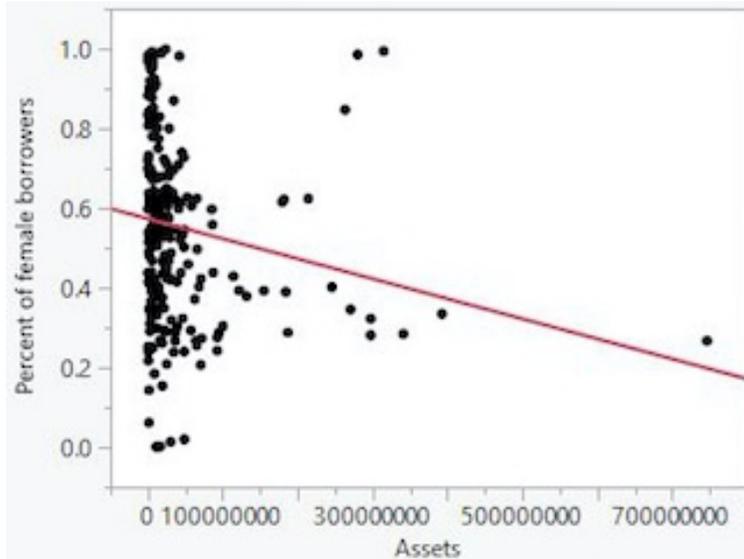
Percent of female borrowers =  $-7.12877 + .0038085 \times \text{Fiscal year}$

RSquare = .000201 | Root Mean Square Error = .229585 | Observations = 256

The mean value was 54.89%, above the threshold for equitable portfolios per this paper's definition. The p-value and f-value reported in the Summary and ANOVA tables for this model were both statistically insignificant, and the correlation between the variables was low (.0141).

No conclusions may be drawn.

#### h. Relationship Between Percent of Female Borrowers and Assets, Africa

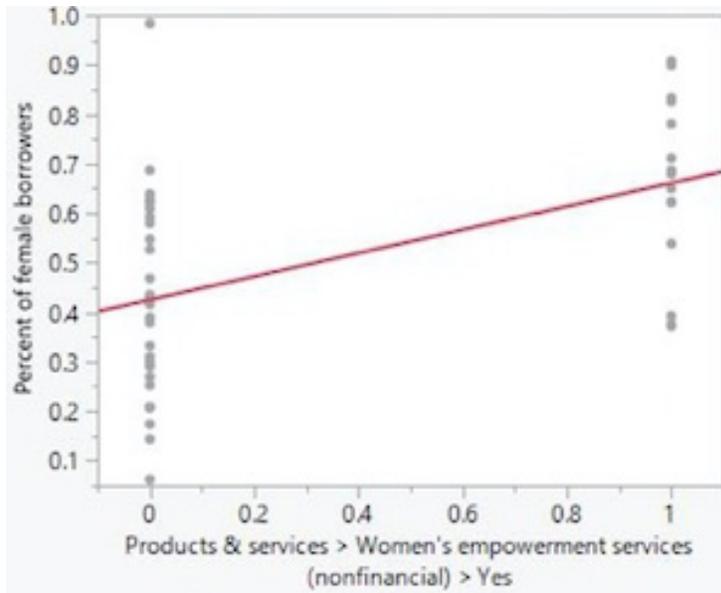


$$\text{Percent of female borrowers} = .5736942 - 5.027e^{-10} * \text{Assets}$$

$$\text{RSquare} = .028616 \mid \text{Root Mean Square Error} = .225747 \mid \text{Observations} = 249$$

Contrary to what was reported in the global version of this model, the Summary and ANOVA tables display a statistically significant p-value and f-value, suggesting the documented relationship is above chance. Moreover, the RSquare value here higher than in the global version of this model. The correlation still low (-.1692), but presuming the existence of a very weak relationship is possible. It may again be explained by a decreased willingness in MFIs to allocate resources towards the various components necessary to lend to women (outreach, delivery to rural locations, etc.) so that returns are not be impacted by associated expenditures.

**i. Relationship Between Percent of Female Borrowers and Women's Empowerment Services (Nonfinancial), Africa**

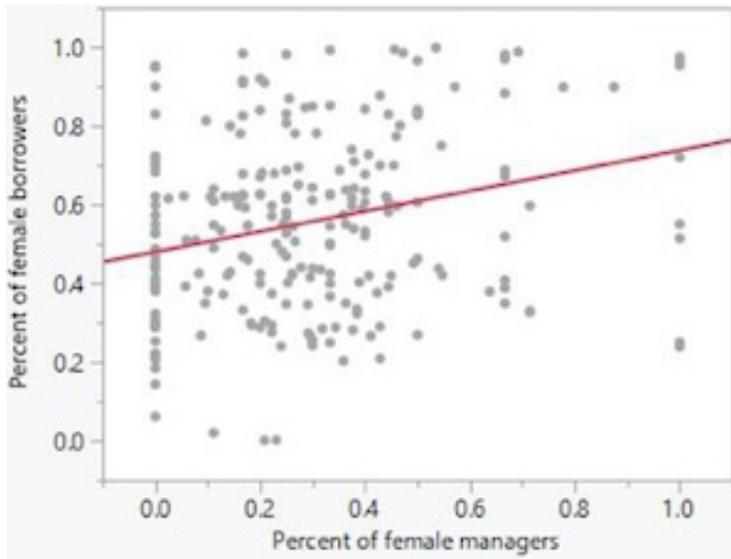


Percent of female borrowers =  $.4252 + .236125 * \text{Women's empowerment services (nonfinancial) > Yes}$

RSquare = .268104 | Root Mean Square Error = .192089 | Observations = 44

While the sample size of 44 observations is of some concern, the Summary and ANOVA tables did reveal a statistically significant p-value and f-value, indicating this positive correlational relationship to be above chance. The given correlation (.5177) supports the idea of a robust relationship between the variables. This RSquare value is also stronger than the RSquare value from the global version of this model; that more variation is explained by this model hints that offering empowerment services may be especially prudent in African markets.

**j. Relationship Between Percent of Female Borrowers and Percent of Female Managers, Africa**

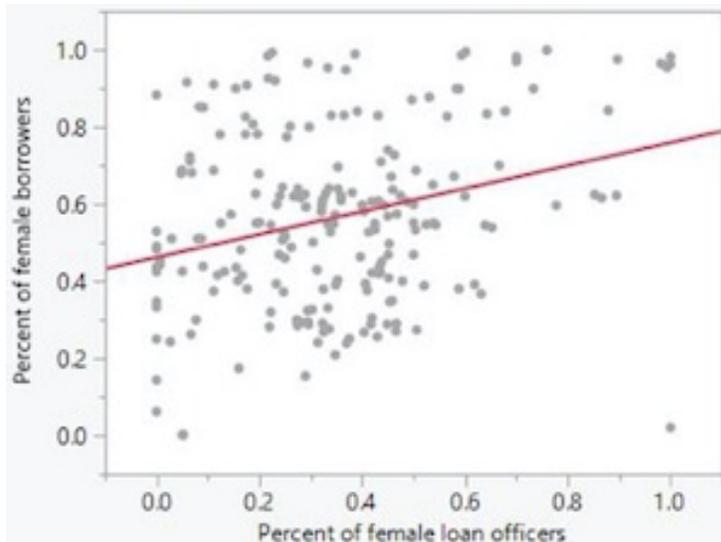


Percent of female borrowers =  $.4799916 + .258107 * \text{Percent of female managers}$

RSquare =  $.074479$  | Root Mean Square Error =  $.217175$  | Observations = 240

The model yielded a statistically significant p-value and f-value, suggesting that this relationship is above chance. Meanwhile, its correlation ( $.2729$ ) indicates a weak, but present, relationship. The RSquare is quite low, so variability is not fully explained through this model. Yet one may still conclude the existence of a positive correlational relationship between these variables due to the significant p-value and f-value.

**k. Relationship Between Percent of Female Borrowers and Percent of Female Loan Officers, Africa**

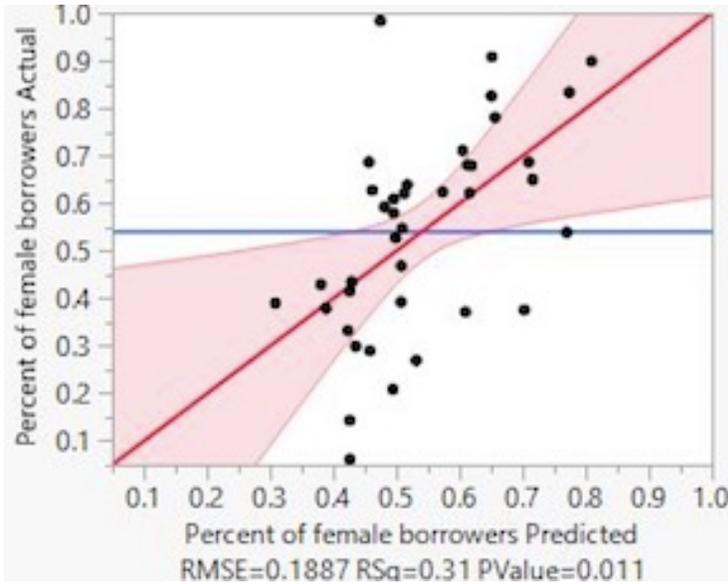


$$\text{Percent of female borrowers} = .461447 + .2973596 * \text{Percent of female loan officers}$$

$$\text{RSquare} = .085051 \mid \text{Root Mean Square Error} = .220013 \mid \text{Observations} = 209$$

The Summary table revealed a correlation of .2916 and a statistically significant p-value and f-value, indicating a weak, but present, correlational relationship. The low RSquare indicates one may not explain variance through this model, but the significant p-value and f-value allow one to at least conclude the existence of a positive correlational relationship. The high degree of unexplained variance in each of these regressions again forced the creation of a multiple regression model so as to obtain better fit.

**I. Relationship Between Percent of Female Borrowers, Assets, Women’s Empowerment Services (Nonfinancial), Percent of Female Managers, and Percent of Female Loan Officers, Africa**



RSquare = .311861 | Root Mean Square Error = .188733 | Observations = 39

Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	0.4277378	0.062133	6.88	<.0001*
Percent of female managers	0.0486624	0.19669	0.25	0.8061
Percent of female loan officers	0.2069043	0.176666	1.17	0.2497
Products & services > Women's empowerment services (nonfinancial) > Yes	0.1894735	0.064425	2.94	0.0058*
Assets	-1.041e-9	6.57e-10	-1.58	0.1227

This model explained much more variance than previous regressions, as indicated by the .3118 RSquare value. The ANOVA table yielded a statistically significant f-value, and per the Parameter Estimates, *offering of nonfinancial women’s empowerment services* is a statistically significant relationship in African markets. Yet there is still a good deal of unexplained variation here, and indeed, across all models. One is unable to determine how much the models are driven by outliers in the data.

## CONCLUSIONS

This paper intended to identify relationships in global and Nigerian microfinance, and then to translate them into actionable recommendations for Nigerian regulatory authorities and MFIs to increase gender equity in the sector. However, the only statistically significant relationship identified in this paper's models is the positive correlation between offering of *nonfinancial women's empowerment services* and *percent of female borrowers*. As a result, the only possible recommendation one could make would pertain to these services; however, noteworthy limitations to the model samples bring even this relationship into question. The goal of the paper was to offer recommendations based on concrete, statistical relationships. As no truly sound statistical relationships were observed, this paper will not offer any.

There are critical data limitations impacting the analyses in this paper. First, the sample size used in each model was not as large as it may have been. This is due in part to variability in the regulatory environments for microfinance institutions, for many MFIs can elect not to submit annual reports containing key metrics including total asset value. The other studied predictor variables, *offering of nonfinancial women's empowerment services*, *percent of female loan officers*, and *percent of female managers*, are assessed using self-reported data. This must also have greatly impacted sample size, but also may mean that the data is skewed due to self-selection processes, wherein only those institutions that are operating with a particular structure choose to report, while important data is withheld from institutions who fear backlash.

Second, the nature of the variables studied is particularly conducive to the simple regression models selected for this analysis. Observations were never quite small enough to merit a partial-squares regression, for instance. However, a subsequent study might attempt a polynomial regression to potentially mitigate effects of multicollinearity and outliers. Similarly,

the chosen independent variables themselves are likely such subtle predictors of the dependent variable that it was sometimes difficult to conclude whether or not a model's correlation met the threshold for significance in the context of this research. A future study may include additional variables that would more obviously impact rates of lending to women, such as a binary for whether fixed collateral was required for credit access, for a more nuanced dataset and multivariate analysis. Such supplementary data on collateral or other specific loan criteria was not accessible for this study.

In some sense, this paper became a study on how *not* to approach the microfinance sector. The high degree of variance in the large-scale models suggests that it is somewhat futile to rely on statistical modeling to identify market-wide trends in microfinance. Quantifying relationships between market variables, even through more sophisticated statistical models than the simple least-squares linear regressions and multiple regressions used here, requires far too much unavailable data. What's more, the extreme variability in the external regulatory environments may further confound models. Ultimately underlying these statistical quandaries is the notion that microfinance markets are not homogenous, and, from a regulatory perspective, should not be treated as such. Regulatory authorities attempting to improve the sector along any dimension are thus best served examining each institution in a qualitative and local context so as to more precisely identify immediate obstacles, as well as any additional tensions with the external community that may inhibit institutional sustainability in the long term.

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