IF SHE BUILDS IT, THEY WON'T COME: EXPERIMENTAL EVIDENCE OF DEMAND-SIDE CONSTRAINTS IN THE GENDER PROFIT GAP

Morgan Hardy
New York University - Abu Dhabi

Gisella Kagy
Vassar College

October 15, 2017

Abstract

This paper uses firm-level and market research data from a field experiment in Ghana's garment making industry to reconsider determinants of the gender profit gap. We document that male-owned firms earn nearly twice as much profit as female-owned firms, driven by a difference in quantity of garments sold, rather than prices charged or costs incurred. These differences in output and profits by owner gender are not explained by differences in observable characteristics of the owner and firm. Turning our attention to market-level constraints, we combine our firm census and market research survey to uncover gender segregation in demand and a gender gap in the market size to firm ratio, suggesting higher demand scarcity for female-owned firms. Finally, using a random demand shock, we observe a large displacement effect of experimental demand on non-experimental revenue for male-owned firms, but no such effect for female-owned firms, implying that female-owned firms are not regularly operating at their production capacity. Our findings highlight the importance of a new dimension to the gender profit gap: that female-owned firms face higher demand-side constraints, rather than exclusively supply-side constraints previously explored in the literature.

JEL Classifications: D22, J16, J31, L25, L26, L67, 012
Total Word Count: About 5,500

We are grateful to David Blakeslee, Raquel Fernández, Dustin Frye, Jamie McCasland, Martin Rotemberg, and seminar participants at Vassar College and the Entrepreneurship and Private Enterprise Development (EPED) in Emerging Economies Conference for helpful comments and suggestions. We also thank Lois Aryee, Robert Obenya, Charles Sefenu, Yani Tyskerud, Edna Kobbinah, and Innovations for Poverty Action-Ghana for excellent research assistance in the field, and Osman Mutawakil for collaborating on the design of the weaving technique used in the demand shock. This research was supported by funding from PEDL, 3ie, USAID, The World Bank, the William and Flora Hewlett Foundation, the Barrett Hazeltine Fellowship for Graduate Research in Entrepreneurship, the Watson Institute for International Studies, and the Population Studies Center at Brown University. All errors are our own. Please e-mail morgan.hardy@nyu.edu and gikagy@vassar.edu with any questions, comments, or suggestions.

1 Introduction

Understanding barriers to the economic empowerment of women is of primary importance within any country's path toward development (Duflo, 2012). Owning a micro-enterprise is a common and growing form of employment for men and, even more so, for women in the developing world (Fox and Sohnesen, 2012; Kevane and Wydick, 2001).[1] While the majority of these micro-enterprises have low profits, enterprises owned by women consistently have even lower profits than those owned by men (Banerjee and Duflo, 2008; Kevane and Wydick, 2001).

The gender profit gap has been well documented, and numerous experiments have explored differences in response to supply-side interventions for male and female-owned firms. Financial and human capital interventions have been shown to be beneficial for micro-enterprises owned by men, but not for those owned by women (De Mel, McKenzie and Woodruff, 2008, 2009*b*; Berge, Bjorvatn and Tungodden, 2014). Bernhardt et al. (2017) use data from several randomized control trials to argue that capital grants for female entrepreneurs are instead being invested in their husband's business. In similar spirit, Fafchamps et al. (2014) shows that female-owned firms respond more to in-kind capital grants than cash.

Although previous studies have highlighted some key supply-side constraints for female entrepreneurs, much of the gender profit gap is still unexplained. Using data from four countries in Africa, Nix, Gamberoni and Heath (2015) show that some of the gender profit gap is explained by differences in owner characteristics (marital status, experience, education, number of children, average monthly hours worked) and firm industry. However, they note that the majority of the gender profit gap is still left unexplained by these observables.

This paper uses detailed data on the universe of garment making firms in a typical mid-sized district capital in Ghana, coupled with a unique experiment that involved random demand shocks at the firm-level, to better understand the determinants of the gender profit gap. We use a rich set of data: (1) a firm-owner census and baseline, (2) an eight week panel of firm-level data, (3) expert-graded product quality measures, and (4) a market research survey. These data are unique in that we not only have detailed supply-side information on firms owned by both genders within the same industry, but we also have demand-side information, both from our customer interviews

[1] Micro-entrepreneurship is often a woman's only alternative to agriculture for work outside of the home (Gindling and Newhouse, 2014; Calderon, Iacovone and Juarez, 2016).

and from our experiment.

The first part of the paper establishes that, even within the same industry, female-owned firms do indeed have lower profits than male-owned firms. Consistent with the prior literature, (Nix, Gamberoni and Heath, 2015; Nordman and Vaillant, 2013) this gender gap in profits is not explained by observable characteristics of the firm and firm owner. We expand on the prior literature by accounting for more detailed characteristics that may affect a firm's profit, namely: product quality, productivity, and reasons for self-employment. Even after including these new measures, the profit gap remains strong and unexplained.

Next, we exploit our detailed weekly panel to deconstruct profit into it's three components: price, cost, and quantity. We show that female-owned firms charge similar prices and have similar costs of production for goods, but they produce significantly lower quantity compared to male-owned firm. We investigate possible supply-side drivers of this quantity gap, by comparing only firms which are similar on key observables that differ by gender. Even after limiting our sample to equate product quality, number of hours worked, and reasons for self-employment, this difference in quantity by firm owner gender remains large.

We then turn our attention to considering a demand-side story for this difference in quantity. Importantly, through our market research survey, we find that demand is segregated based on gender. We also know from our firm census that there are three times as many female-owned firms in the market as male owned firms. Our market research survey also indicates that women order approximately the same number of garments as men.[2] Taken together, these facts imply a lower total market size to firm ratio for women. The importance of this difference is descriptively confirmed by self-reported barriers to business success from the firm owners. The most common barrier that women site is a lack of customers, while men most commonly report supply-side constraints.

Finally, we exploit our random demand shock to show experimental evidence that female-owned firms are not operating at production capacity. With a random increase in the number of garments ordered from a firm, we see male-owned firms decrease their usual production to accommodate our experimental order, while female-owned firms do not. This difference in results suggests that male-owned firms are already producing at capacity, while female-owned firms have the capacity

[2]Women in our random customer sample ordered only .2 more garments in the last year than men

to produce more than they usually do.

Taken together, the evidence presented in this paper is inconsistent with the argument that supply-side factors are the binding constraint for increasing female-owned firm profits in this context. Rather, it better supports an alternative explanation: Limited formal employment opportunities for women in developing countries causes an oversupply of female micro-entrepreneurs. This crowding (and gender segregation in industry choice) induces a lower market size to firm ratio and higher demand scarcity for female-owned firms. This demand scarcity decreases profit per owner for women, thus contributing to the gender profit gap. Our findings suggest the need for future research on demand-side interventions for female-owned firms and a policy focus on increasing alternative employment opportunities for women in the developing world.

This paper proceeds as follows: In Section 2, we describe the context, sample, demand shock experiment and data. In Section 3, we provide descriptive analysis of the gender profit gap and show the gap is not explained by traditional observable characteristics, which is consistent with previous literature. We also exploit the richness of our data to analyze additional supply-side explanations for the gap such as worker productivity, product quality differences and differences in reasons for entering self-employment. In Section 4, we deconstruct profit into its components - price, cost and quantity - and find the large difference in quantity produced by gender is the main driver for the observed gender profit gap. We show the large differences in quantity, and profit, remain even when analyzing subgroups of women that are similar to men in terms of product quality, time spent working and reasons for self-employment. In Section 5, we present descriptive and experimental evidence that women face a demand constraint which is contributing to the gender profit gap. Section 6 concludes.

2 Context, Sample and Data

2.1 Garment Making Firms in Ghana

Studying the garment making industry in Ghana is an illustrative example of microenterprises in developing countries. The industry has several key characteristics that are similar to other microenterprises in developing countries. First, the firms are of small-scale, typically having no paid employees besides the owner. Firms use simple technology that does not require large capital

investments. In this context, a mixture of human powered and electrically powered sewing machines are used to produce garments. Second, these microenterprises are ubiquitous and produce similar products. The most common garments are men's shirts and slit and kabbah (traditional Ghanaian skirt and top for women). Third, the majority of garment production is sold to the local market rather than exported.

One key difference about the garment making industry in Ghana, compared to other microenterprises in developing countries, is the gender composition of firm owners. Most microenterprise industries are almost exclusively dominated by one gender, however the garment making industry in Ghana contains both male and female owners. Of the universe of garment making firms in Hohoe, 77 percent are owned by women.

2.2 Sample

To study the gender profit gap in the garment making industry we use information from firms in Hohoe, Ghana. Hohoe is a mid-size district capital with a population of 73,641 in 2010. Hohoe District borders Togo and is considered a middle income district by Ghanaian standards.

Our sample consists of all garment making firms in Hohoe town and surrounding suburbs in February of 2014. To ensure that all firms in the town were included in the study, we acquired a list of firms from the local trade association and had surveyors canvass the town identifying any commercial storefronts for garment making firms and inquiring with locals in commercial areas about any less visible garment making firm owners. The census, completed in February 2014, identified 445 garment making firm owners. The experiment (discussed below) began in February 2015. At this time 417 of the original 445 firm owners were still in operation. These 417 firm owners are our primary sample.[3] We use firm owner as the unit of measurement instead of firm. Co-ownership of a firm occurs in 12% of the sample, however co-owned firms are able to easily divide expenses and revenues.

2.3 Demand Shock Experiment and Data

We summarize here the experiment that randomly selected firms to receive a demand shock and the data collected. More details on the experimental design and data collection can be found in

[3]Attrition is not correlated with treatment status in the experiment discussed below.

Hardy and McCasland (2016).

In this paper we use data from a randomized controlled trial that randomized two things for garment making firm owners in Hohoe: (1) an invitation to learn a new design technique to be used on garments, (2) demand for garments with the new design. Both randomizations were stratified by gender. Firms were randomized to receive a demand shock of various sizes. The experimental demand for garments was either 0, 1, 4 or 10 garments that used the new design technique. The size of these orders respectively correspond to the median, 90th percentile and 99th percentile of a firm's weekly sales in the sample. For the experiment, 78.57 % of female-owned firms and 78.95 % of male-owned firms received a positive demand shock.[4]

The primary focus of this article is investigating the impact of the demand shock experiment on profits with respect to gender, however it is useful to briefly discuss the new design technique which some firm owners were invited to learn. The new design, called Sharawakil, was commissioned specifically for this project and has three key features. First, the design is unisex and appropriate for use in both men and women's clothing. Second, any size firm can easily implement the design. Execution of the design requires no electricity and minimal capital investments. The only capital required is a deconstructed common children's toy car easily found in local markets for 5 GHS (approximately 1.1 USD). Third, the design technique is easy to learn. All those invited to the one-day training mastered the technique.[5]

Data for this article come from four sources: (1) a firm census and baseline survey done prior to randomization of new design technique or demand shock, (2) weekly surveys conducted for seven consecutive weeks, (3) a market research survey, and (4) product quality assessments. Figure 1 shows the project time-line and timing of each of the data sources.

Baseline data was collected July through September 2014. The baseline survey collected information from each firm owner about their personal characteristics, reasons for self employment, family structure, cognitive ability (as measured by the Ravens Matrix Reasoning Test), information about the firm's assets, workers, previous month's sales, expenses, profits and productivity measures. For seven consecutive weeks during March and April of 2015, data was collected from each firm owner. This high frequency follow up data included detailed information on weekly sales,

[4]The sample is balanced on covariates by gender. Table available upon request.

[5]Additional details on Sharawakil can be found in Hardy and McCasland (2016).

expenses, hours worked and number of garments produced. The random Sharawakil training took place after the first week of weekly data collection. The remaining weekly data collection occurred during the six weeks directly following the random Sharawakil training. The demand shock experiment occurred in June of 2015, after which an eighth round of data collection obtained information from each firm owner about sales, expenses and garments produced for the prior two weeks.

The third source of data we use is a market research survey conducted in March and April of 2015, when the high frequency firm data was also being collected. In the market research survey, nearly 1,600 customers were interviewed. Customers reported how often they buy from garment makers, which specific garment makers they purchase from, and reasons for buying from that specific firm. We are able to link customers to the firm(s) they purchase garments from. The individuals interviewed in the market research survey were chosen at random from public places near each of the garment making firms in our sample.

Objective product quality assessments are our fourth source of data. In July and August of 2016 one garment was ordered from each firm owner in the sample. On a scale from 0-10, three garment making industry leaders in Ghana independently rated the quality of the garments. The industry leaders did not know the gender of the firm owner from which the garment came. This allows us to create a composite garment quality rating for each firm owner to determine how product quality varies by gender and if this dimension helps to explain the gender profit gap.

3 Descriptive Analysis of Gender Profit Gap

Garment making firms owned by men in our sample are significantly more profitable than garment making firms owned by women. Using data from the baseline survey of garment firms in Hohoe, Figure 2 plots firm profit last month by gender. Firms owned by men earn 217 GHS in profits on average the previous month and women owned firms earned 115 GHS on average, or only 52% of men's profits. Men experience greater variance in their profits and have a longer right tail in their distribution. The fact that female-owned firms are less profitable than male owned firms within the same specific industry is the driving motivation behind this research article.

3.1 Firm Owner Characteristics

Using data from the baseline survey, Panel A of Table 1 explores the differences in firm owner characteristics for garment making firms owned by men and those owned by women. Male firm owners are on average 4 years older, have more children living in their households, but are not differentially likely to be married compared to female firm owners. Importantly, the education levels of men and women who own firms are nearly identical at 8.9 years of education. Similarly, when measuring cognitive ability, using the Ravens Matrix Reasoning Test, men and women firm owners have the same reported score of 5.6 out of 12.[6] These results suggest that while men in the occupation are older, they are not positively selected in terms of education or cognitive ability. Thus, ruling out the possibility that firms owned by women in Ghana are less profitable than firms owned by men because the women are not as skilled or capable based on the observable characteristics of the individual.

It is important to note that owning a garment making firm is both men and women's primary economic activity, 94% and 89% percent respectively, but women are significantly more likely to also have another business. Thirty one percent of women in the sample have an additional business, compared to only 7% of the men. Most of these businesses are selling merchandise out of the same location as the garment making firm.

Table 2 documents how the gender profit gap changes when observable covariates are controlled for. When no characteristics are accounted for the gender profit gap is 102 GHC, or male-owned firms make 89% more than female-owned firms, as shown in column 1. Column 2 includes basic characteristics of the firm owner used in prior literature (Nix, Gamberoni and Heath, 2015): marital status, age, education, number of children and hours worked last week. While years of schooling and hours worked last week are positively correlated with profits, the inclusion of firm owner characteristics does not erase the gender profit gap, consistent with Nix, Gamberoni and Heath (2015). The profit gap decreases slightly to 77 GHC, but is still highly significant. To include a measure of ability, Column 3 adds in the firm owner's cognition, as measured by the Ravens Matrix Reasoning Test. Cognitive ability may measure an important dimension of a firm owner's overall ability that years of education does not capture. While cognitive ability is positively correlated

[6]The Ravens Matrix Reasoning test is used as a non-verbal and simple measure of general intelligence and perhaps the most common and popular test for people above the age of 5 (Kaplan and Saccuzzo, 2009).

with profit the gender profit gap remains virtually unchanged at 77 GHC.

3.2 Productivity Characteristics

Panel B of Table 1 present firm and productivity characteristics. This data comes from the baseline survey where firm owners were asked about the prior month. Firms owned by men are significantly more profitable and do almost twice the sales volume as women owned firms. However, the ratio of profits divided by sales is similar across the two types of firms at 0.70. This suggests that what is driving the increased profits for male owned firms is not increased profit per garment, but rather the quantity of garments being sold.

Most firms in the sample have no paid employees, but male owned firms are ten percent more likely to have a paid employee besides themselves. However, the total number of works does not significantly differ between firms owned by men and women as women owned firms are significantly more likely to have an apprentice. Men work on average 55 hours per week, while women work 42 hours, and firms owned by men have significantly more assets. The firms owned by men produce a significantly higher volume of output, 25 garments per month, compared to 19 garments for firms owned by a woman. However, the average time to produce a garment is similar between firms owned by women and men at approximately 2 hours. All of these characteristics imply that men own firms with more assets, they work longer hours, and produce more garments, but do not have significantly increased productivity per worker.

Table 2 Column 4 documents how the gender profit gap changes when typical firm level covariates - age of the business, value of assets, and total number of workers - are controlled for in addition to the individual firm owner characteristics. With these covariates accounted for, profits from male-owned firms are on average 85 GHC higher than profits from female-owned firms. This difference is significant at the one percent level. While the value of a firm's assets and total number of workers are positively associated with profit, they do not erase the gender profit gap. In Column 5, we account for productivity differences by including the typical amount of time it takes to produce a garment. We see the profit gap is essentially unchanged.

3.3 Other Potential Supply-Side Explanations

Now we exploit the richness of our data to analyze other potential supply-side explanations for the gender profit gap. Namely we explore the how differences in product quality and reasons for entering self-employment impact the observed gender difference in profits. Panel C of Table 1 presents summary statistics of these measures.

Women and men may enter into micro-entrepreneurship for different reasons, and these reasons may be correlated with an unobserved characteristic, such as motivation, that can influence profit. To explore this possibility we look at how important the ability to care for children while at work and potential for future growth was for an individual when they were deciding to be self-employed. Women are significantly more likely to report child care as a very important reason as to why they are self-employed. 42% of women report the ability to care for children is a very important reason why they became micro-entrepreneurs, as opposed to 23% of men. This difference signals that, compared to men, more women are opening their microenterprises out of necessity rather than opportunity. While men are more likely to cite the potential for future growth as a very important reason for being self-employed compared to women, 62% and 53% respectively. Indicating that men are more likely to be garment makers because of potential opportunity, compared to women. Interestingly, when looking at individual and firm level characteristics the women who report child care as a very important reason for self-employment are not statistically different from women who do not report child care as being a very important reason for self-employment. Indicating that typical observable characteristics, such as education and cognition, fail to capture important heterogeneity within women.

Table 2 column 6 shows the gender profit gap does not change when reasons for self-employment are accounted for. Neither the ability to care for children while at work nor potential for future growth are correlated with profits.

It is also plausible that women owned micro-enterprises are not as profitable as their male counterparts because the quality of the product they produce is lower and traditional survey questions about the firm and firm owner miss this dimension. To explore this potential mechanism we use an objective garment quality measure, where 3 industry experts rated one garment from each firm on a scale of 0-10. Garments were labeled by a randomly generated firm ID. The industry experts

did not know any of the characteristics of the firm or firm owner from which the garment came. To create a composite garment quality measure we take the average of the three ratings. Table 1, Panel C, shows the average quality difference between garments from male and female owned firms. Garments from women owned firms are rated an average of 1.5 points less in terms of quality than garments from male owned firms. Figure 3 plots the distribution of garment quality by gender. While men do have higher rated garments than women on average, there is a subset of the women who have the same, or higher, garment quality rating as men.

Average quality is included in column 7 of Table 2. The profit gap remains unchanged at 82 GhC, suggesting that differences in quality are not driving the gender profit gap.

4 The Components of Profit

To investigate which component, or combinations of components, of profit (price, cost or quantity) are driving the observed difference between male and female owned firms we deconstruct profit into its basic elements.

For firm i, we have the following relationship:

$$\pi_i = (P_i - C_i) * Q_i \tag{1}$$

Where π_i is profit for firm i, P_i is the price per order, C_i is the cost per order, and Q_i is the number of orders. Using the high frequency weekly data, we have information from each firm on the average price charged per garment or alteration the previous week, the total number of orders, and can calculate how much an order cost to produce. The average cost of an order, either a new garment or an alteration, includes both fixed and variable costs. Weekly variable costs include wages, cost of inputs (i.e. materials) and any outsourcing costs. Fixed costs include any bills paid such as electricity, rent, taxes, and any expenditures on capital such as furniture, machinery, tools or repairs in the previous week. We then sum these measures over the seven weeks prior to the demand shock for each firm. High frequency data of this nature is preferred because it minimizes recall error and having this data over 7 weeks reduces the mismatch between the timing of costs and sales (De Mel, McKenzie and Woodruff, 2009*a*).

Table 3 decomposes the gender profit gap for all firm owners in the sample. Data for this table

come from the seven weeks of high frequency weekly data collection prior to the demand shock experiment. Over these seven weeks women owned firms have an average profit of 160 GHS and male owned firms have an average profit of 344 GHS, a difference of 184 GHS which is significant at the one percent level. The price of an order and the cost of an order are similar between firms owned by men and women at approximately 8 and 4 GHS respectively. However, men have on average 32 more orders in the seven weeks compared to women. This significant difference in quantity demanded explains 69 percent of the profit gap.

Having established that the difference in quantity, rather than differences in price or cost, is driving the profit gender gap we now explore if this is true for subsets of women owners that have similar characteristics to their male counterparts.

4.0.1 Differences in Product Quality

If product quality differences were causing decreased demand from women owned firms, we should see the quantity demand be the same from women and male owned firms when we restrict the sample of women owned firms to those that have the same quality product as the men. Table 4 analyzes the profit decomposition for male and female owned firms that have equally high product quality. A significant gender profit gap still exists when considering only firms that make high quality garments. Firms owned by women have half the profit that firms owned by men do. As with the general sample, price and cost are not significantly different between the genders but men receive an average of 25 additional orders over the seven weeks, or an increase in demand of 55%.

4.0.2 Differences in Number of Weeks Firm is Open

Another potential reason why there is less quantity produced from firms owned by women is because of differences in how often the firms are open for business. Over the seven week period, women are active 0.8 weeks less than male owned firms.[7] Differences in the quantity of garments being produced from male and female owned firms could simply be due to the limited working hours of female owned firms. To test if this is true, we restrict the sample to women and men that were active all 7 weeks of data collection.

[7]This is because traditionally women are responsible for caring for sick family members and many must travel away from Hohoe to do this.

Table 5 shows the components of profit for this sample of individuals who work all weeks during the high-frequency data collection. A significant gender profit gap of 155 GHC still exists. The price charged and cost to produce the garment are not significantly different by gender, but male owned firms have an additional 25 orders over the seven weeks. These results imply that quantity demanded of a firm is different by gender even when only looking at firms that input the same amount of time. Women owned micro-enterprises are not producing fewer garments simply because they are working less.

4.0.3 Differences in Reasons for Entering Self-Employment

Individuals may enter into self-employment because they see an opportunity for growth and earnings or they may enter because they lack other options and thus are entering out of necessity (Calderon, Iacovone and Juarez, 2016). These two types of micro-entrepreneurs may have different unobserved characteristics that are correlated with profits. To signal if someone is a necessity micro-entrepreneur, we use reasons why an individual entered into self-employment. Specifically, someone is a necessity micro-entrepreneurs if the ability to watch their children was a very important reason for self-employment.

To test if the necessity micro-entrepreneurs are decreasing the average quantity produced for women, we restrict the sample to those that are not necessity micro-entrepreneurs (indicating that they are opportunity micro-entrepreneurs). Table 6 displays these results. For this subset of firms, the gender profit gap is large and statistically significant. Average price and cost per order are similar between firms owned by women and men, but male-owned firms have on average 30 additional orders over the seven weeks. Suggesting that even when looking at similar firm owners - in terms of why they entered into self-employment - women owned firms still have significantly lower profits, and this is being driven by a lower number of orders.

5 Demand-side constraints

In this section, we turn our attention to a different possible explanation of the gender profit gap, that of demand constraints. As shown above firms owned by women consistently produce less quantity compared to male owned firms, even when the sample of women owned firms is similar

to male owned firms in terms of product quality, time spent working and reasons for entering self-employment. Supply side arguments can not fully explain why quantity demand is lower for women owned micro-enterprises.

Another possibility is that women owned firms face insufficient demand and are not producing at their full potential due to a lack of customers. There are over three times as many women firm owners in the market than male owners, 321 versus 95, as women are much more likely to enter into micro-entrepreneurship out of necessity rather than opportunity. The additional women becoming firm owners creates a crowded market that increases competition among women. From the market research survey we know that demand is segregated based on gender. 83% of customers at female-owned firms are female, while only 12% of customers at male-owned firms are female (Table 7). This fact, in combination with the surplus of women firm owners in the market, creates less potential demand for each firm owned by a woman.

Additional data from the point of view of the firm owner further supports the assertion that women's business are not growing or increasing their profit due to insufficient demand. Firm owners were asked what the biggest barriers to growth in their businesses were. Table 8 breaks down the responses by gender. The most common barrier to growth for women owners was not having enough customers. 57% of women owned firms cited lack of customers as a barrier to growth, while only 42% of male owned firms did. The most common barrier to growth for men was supply side related, in lack of supply of electricity and water.

5.1 Randomized Demand Shocks and Non-Experimental Demand Displacement

As explained above, as part of a larger project, firm owners were randomized into various demand shock groups: 0, 1, 4, and 10 garments. Firm owners selected to receive a garment order were approached by a member of our implementation team and offered a two week contract to sew 1, 4, or 10 garments, depending on their treatment assignment. Firm owners had three days to either accept or refuse the contract.[8] Not all firm owners accepted the order. The order randomization

[8] As part of the field experiment design in Hardy and McCasland (2016), each garment was required to include the use of a specific and new weaving technique on which there had been a training for a random subset of the market two months prior to the demand shock intervention. The three days were intended to allow firm owners who did not yet know the technique to search for someone to teach them so they may accept the order in good faith that they would be able to complete it in the two week window.

and acceptance rates are not statistically significantly different by gender.

If the lower quantity produced by female owned firms is supply driven, meaning that it is driven by the firm hitting a capacity constraint in the production function, either of management, labor, capital or otherwise, then it should be the case that an experimental demand shock would displace non-experimental demand. On the contrary, if we do not see this displacement, this evidence would suggest that the firm is constrained not from the supply side but from something effecting the demand side, i.e. that this firm is not operating at production capacity and could take on more orders.

Table 9 - Column 1 - reports the heterogenous intent-to-treat (ITT) effects of the number of garments assigned (0, 1, 4, or 10) for the demand shock on non -experimental revenues, by gender. From Column 1, we see that female-owned firms do not experience demand displacement, while male owned firms experience displacement of approximately 15 GhC of revenue for each garment assigned. These results become stronger to the level of approximately 18 GhC in Column 2, which reports treatment on the treated (TOT) effects of accepting and completing our experimental order. Finally, Column 3 reports a GhC for GhC TOT comparison, looking at the direct trade off of experimental revenue with non-experimental revenue. Again, we see no such trade-off for female-owned firms, which absorb the experimental demand revenue with no displacement of non-experimental revenue. We see this displacement only for male owned firms, which see a decrease of approximately 2 GhC of non experimental revenue for each 1 GhC of experimental revenue earned.

These results suggest that male owned firms are operating at the capacity of their production functions, being unable to absorb the increased output of the experimental demand without displacing some other output. The same is not true for female-owned firms, which expand production to satisfy both the experimental and non-experimental demand, without any such displacement.

6 Conclusion

Micro-enterprises matter greatly for the lives of individuals living in the developing world, especially women. Within these micro-enterprises there exists a large and constant profit gap between firms owned by women and those owned by men. Understanding barriers to the success of small firms, particularly small firms owned by women, is thus of key importance to policy makers focused on

increasing the welfare of women around the world.

Although it is likely that part of the explanation for the gender profit gap is supply-side constraints, such as access to capital, this paper provides evidence supporting an under-considered side of the story, that of demand constraints. Our findings suggests that policies and programs focused on increasing alternative labor market opportunities for women (to decrease crowding in currently female-dominated industries) or increasing access to alternative customer sources for female-owned firms (to more directly ease demand-constraints) may see strong results in the fight against gender profit inequality.

References

Banerjee, Abhijit V, and Esther Duflo. 2008. "What is middle class about the middle classes around the world?" *The Journal of Economic Perspectives*, 22(2): 3–41A.

Berge, Lars Ivar Oppedal, Kjetil Bjorvatn, and Bertil Tungodden. 2014. "Human and financial capital for microenterprise development: Evidence from a field and lab experiment." *Management Science*, 61(4): 707–722.

Bernhardt, Arielle, Erica Field, Rohini Pande, and Natalia Rigol. 2017. "Household Matters: Revisiting the Returns to Capital among Female Micro-entrepreneurs." National Bureau of Economic Research.

Calderon, Gabriela, Leonardo Iacovone, and Laura Juarez. 2016. "Opportunity versus necessity: understanding the heterogeneity of female micro-entrepreneurs." *The World Bank Economic Review*, 30(Supplement_1): S86–S96.

De Mel, Suresh, David J McKenzie, and Christopher Woodruff. 2009*a*. "Measuring microenterprise profits: Must we ask how the sausage is made?" *Journal of development Economics*, 88(1): 19–31.

De Mel, Suresh, David McKenzie, and Christopher Woodruff. 2008. "Returns to capital in microenterprises: evidence from a field experiment." *The quarterly journal of Economics*, 123(4): 1329–1372.

De Mel, Suresh, David McKenzie, and Christopher Woodruff. 2009*b*. "Are women more credit constrained? Experimental evidence on gender and microenterprise returns." *American Economic Journal: Applied Economics*, 1(3): 1–32.

Duflo, Esther. 2012. "Women empowerment and economic development." *Journal of Economic Literature*, 50(4): 1051–1079.

Fafchamps, Marcel, David McKenzie, Simon Quinn, and Christopher Woodruff. 2014. "Microenterprise growth and the flypaper effect: Evidence from a randomized experiment in Ghana." *Journal of development Economics*, 106: 211–226.

Fox, Louise, and Thomas Sohnesen. 2012. "Household enterprises in Sub-Saharan Africa: why they matter for growth, jobs, and livelihoods." The World Bank Policy Research Working Paper Series 6184.

Gindling, TH, and David Newhouse. 2014. "Self-employment in the developing world." *World Development*, 56: 313–331.

Hardy, Morgan, and Jamie McCasland. 2016. "It Takes Two: Experimental Evidence on the Determinants of Technology Diffusion." *Unpublished paper*.

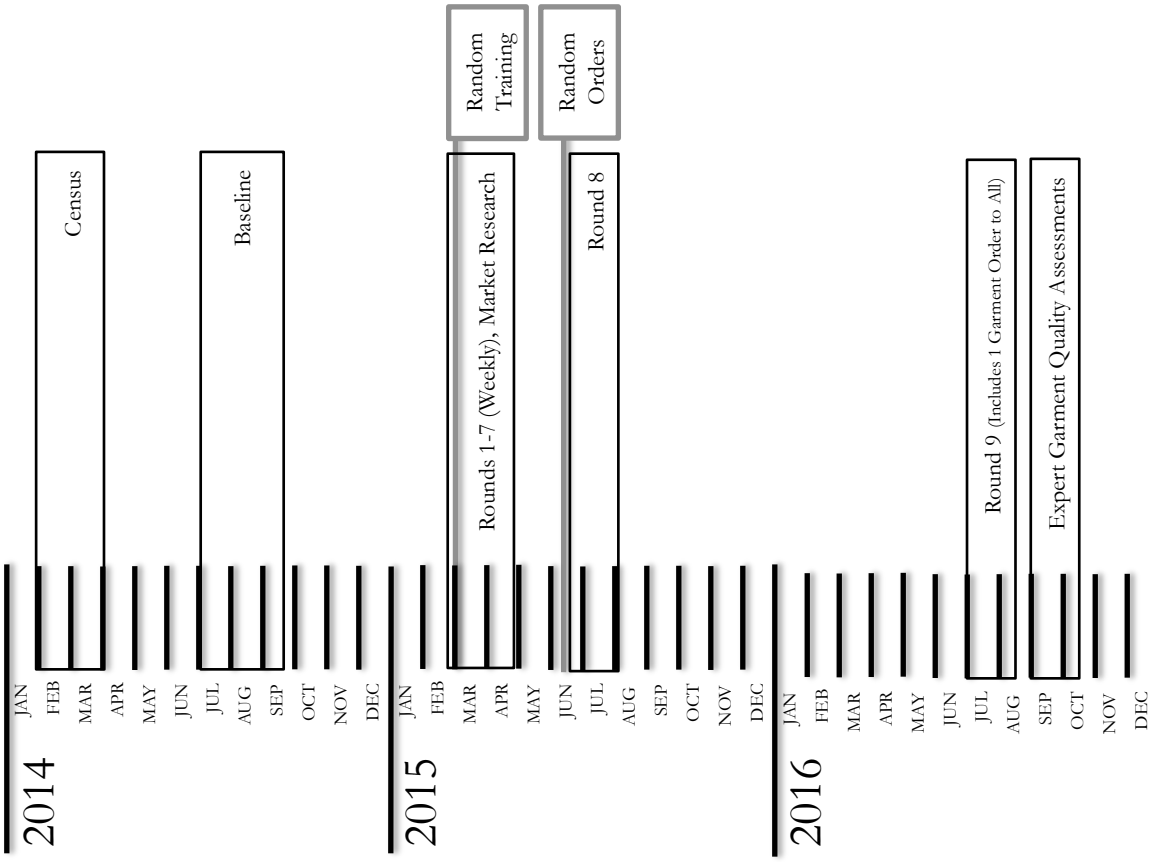
Kaplan, RM, and DP Saccuzzo. 2009. "Standardized tests in education, civil service, and the military." *Psychological testing: Principles, applications, and*, 7: 325–327.

Kevane, Michael, and Bruce Wydick. 2001. "Microenterprise lending to female entrepreneurs: Sacrificing economic growth for poverty alleviation?" *World development*, 29(7): 1225–1236.

Nix, Emily, Elisa Gamberoni, and Rachel Heath. 2015. "Bridging the Gender Gap: Identifying What Is Holding Self-employed Women Back in Ghana, Rwanda, Tanzania, and the Republic of Congo." *The World Bank Economic Review*, 30(3): 501–521.

Nordman, Christophe J, and Julia Vaillant. 2013. "Inputs, gender roles or sharing norms? Assessing the gender performance gap among informal entrepreneurs in Madagascar."

Figure 1: Project Timeline



Source: Figure from Hardy and McCasland (2016)

Figure 2: Profits Last Month by Gender

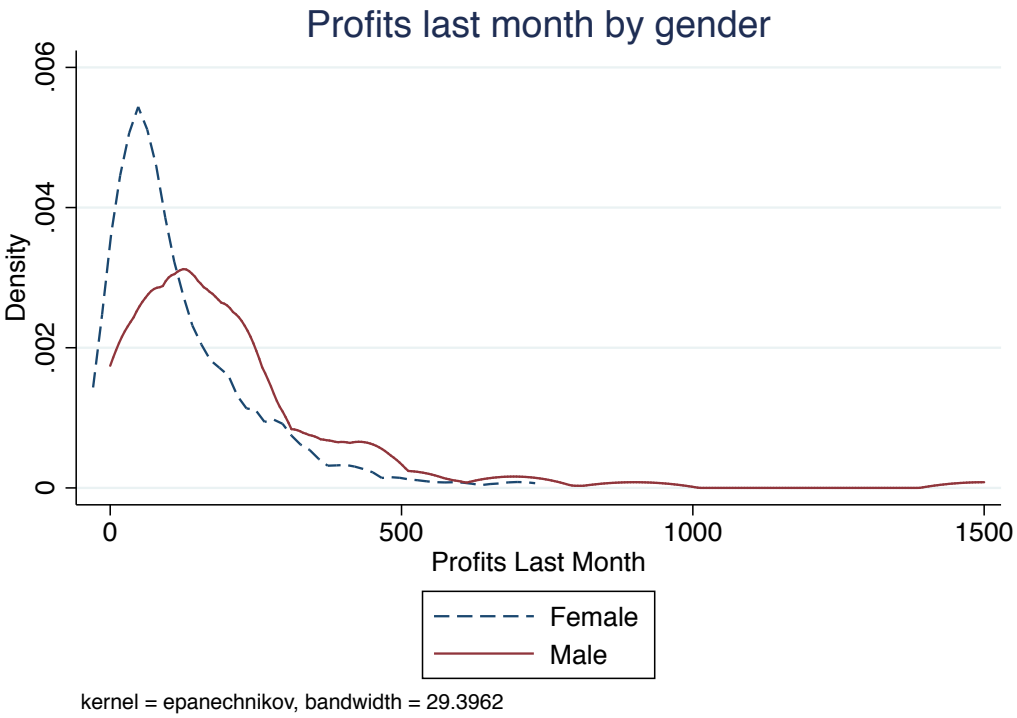


Figure 3: Garment Quality by Gender

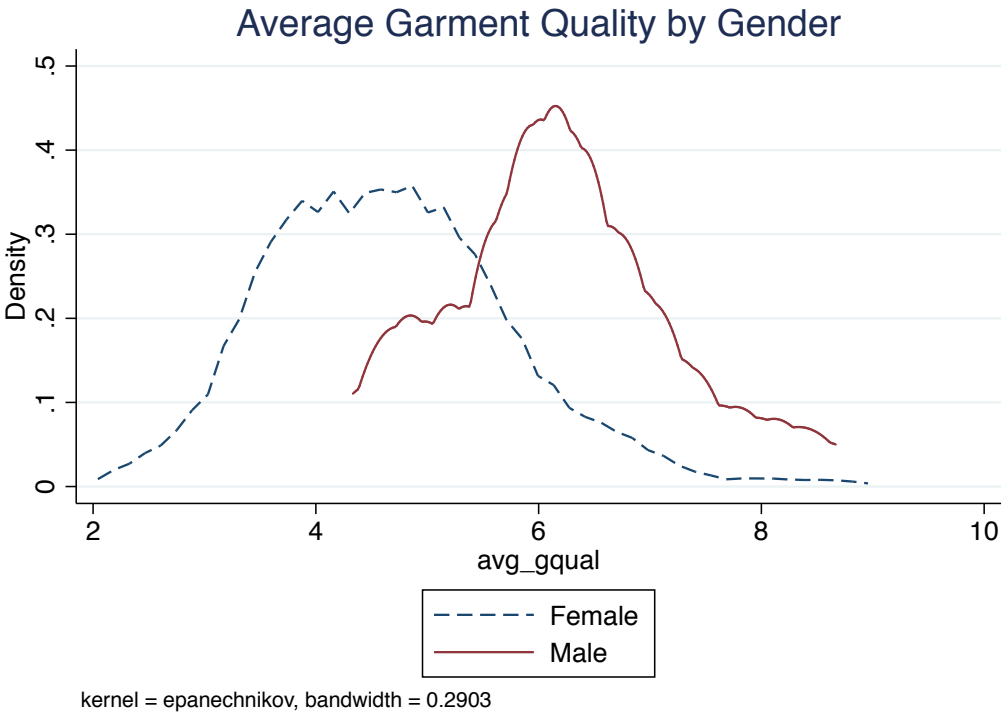


Table 1: Summary Statistics

	Men		Women		Difference	
	Mean	N	Mean	N	in Means	T-Stat
Panel A: Firm Owner Characteristics						
Married or Living with a Partner	0.73	95	0.7	322	0.02	0.46
Age	38.87	91	34.53	305	4.34	3.98
Years of Schooling	8.89	91	8.84	305	0.05	0.18
Children in Household	2.23	95	1.71	322	0.52	3.35
Ravens Score (out of 12)	5.68	95	5.61	322	0.07	0.23
Has another business	0.07	95	0.31	322	-0.24	-4.76
Firm is the primary economic activity	0.94	95	0.89	322	0.05	1.31
Panel B: Firm Characteristics						
Profits Last Month (GHC)	216.84	95	114.7	321	102.17	5.84
Sales Last Month (GHC)	308.81	95	163.5	321	145.27	5.92
Profits/Sales	0.7	90	0.69	286	0.01	0.67
Hours Worked Last Week	55.4	95	41.96	321	13.44	6.65
Profits per Hour (GHC)	0.98	89	0.66	299	0.32	3.32
Assets (GHC)	1605.31	95	1099	322	506.41	2.62
Firm age	11.45	91	8.91	305	2.54	2.61
Number Paid Workers (excl owner)	0.15	91	0.05	305	0.11	2.79
Number Apprentices	0.43	91	0.76	305	-0.34	-1.95
Unpaid Workers	0.26	91	0.22	304	0.04	0.57
Total Workers	0.85	91	1.03	304	-0.19	-0.96
Number of Garments for customers last month	25.46	95	19.35	322	6.12	2.78
Number of Alterations last month	8.41	86	3.25	290	5.16	5.84
Number of Customers last Month	14.75	91	9.69	286	5.06	4.95
Typical time to make garment	2.19	94	2.38	300	-0.19	-0.94
Panel C: Reasons for Self-Employment and Garment Quality						
Caring for Children - Very Important Reason for Self-Employment	0.23	95	0.42	322	-0.19	-3.41
Potential Future growth - Very Important Reason for Self-Employment	0.62	95	0.53	322	0.09	1.5
Average Garment Quality	6.16	83	4.66	270	1.51	11.35

Table 2: Gender Profit Gap and Covariates

	(1) Profits	(2) Profits	(3) Profits	(4) Profits	(5) Profits	(6) Profits	(7) Profits
Male	102.2***	76.77***	77.05***	85.18***	82.15***	81.29***	82.19***
	(17.51)	(17.54)	(17.38)	(16.60)	(17.12)	(17.41)	(22.55)
Married		5.878	7.406	8.012	12.63	13.05	17.58
		(16.14)	(16.01)	(15.34)	(16.25)	(16.33)	(19.21)
Age		-0.276	-0.493	-1.905	-1.861	-1.880	-2.056
		(0.888)	(0.883)	(1.235)	(1.297)	(1.302)	(1.527)
Years of School		10.12***	8.812***	6.834**	6.789**	6.768**	8.526**
		(3.046)	(3.053)	(2.980)	(3.150)	(3.171)	(3.624)
Number of Children		-0.585	-0.455	-2.597	-3.685	-3.471	-3.588
		(4.924)	(4.880)	(4.681)	(4.960)	(4.978)	(6.154)
Hours last week		1.877***	1.842***	1.281***	1.301***	1.296***	1.190**
		(0.390)	(0.387)	(0.379)	(0.406)	(0.408)	(0.476)
Ravens (out of 12)			7.413***	5.414**	5.945**	6.044**	5.582*
			(2.607)	(2.493)	(2.604)	(2.613)	(2.975)
Age of Firm				1.690	1.507	1.481	1.503
				(1.268)	(1.320)	(1.324)	(1.581)
Assets (GHC)				0.0188***	0.0189***	0.0185***	0.0226***
				(0.00505)	(0.00518)	(0.00521)	(0.00612)
Total Labor				17.12***	17.24***	17.26***	16.87***
				(4.255)	(4.382)	(4.392)	(4.807)
Time to Produce Garment					4.339	4.266	4.903
					(4.170)	(4.203)	(4.637)
Children Important Reason						-0.520	-3.074
						(14.23)	(16.19)
Potential Growth Important Reason						10.30	16.53
						(13.68)	(15.61)
Garment Quality							-4.217
							(7.419)
Constant	114.7***	-54.86	-76.85*	-25.19	-38.93	-43.70	-35.56
	(8.367)	(41.96)	(42.30)	(45.63)	(48.00)	(49.16)	(66.31)
N	416	396	396	395	373	373	318

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Profit Deconstruction - All Firms

	Women	Men	Diff in Means	Percent of Profit Gap Explained
Total Profits (GHC)	160.10	344.43	-184.33***	
Average Order Price (GHC)	7.94	8.37	-0.42	9.40
Average Order Expense (GHC)	4.00	3.64	0.36	7.86
Total # Orders	40.60	72.84	-32.24***	68.84
Number of Firms	310	94		

Table 4: Profit Deconstruction - Firms With High Quality Garments

	Women	Men	Diff in Means	Percent of Profit Gap Explained
Total Profits (GHC)	177.58	351.94	-174.37***	
Average Order Price (GHC)	8.08	8.47	-0.40	10.28
Average Order Expense (GHC)	4.23	3.54	0.68	18.21
Total # Orders	46.11	71.37	-25.27***	55.74
Number of Firms	76	67		
Average Quality	5.95	6.51		

Note: Firms included in this sample are those who had a garment quality rating of 5 or higher.

Table 5: Profit Deconstruction - Firms Open Every Week

	Women	Men	Diff in Means	Percent of Profit Gap Explained
Total Profits (GHC)	229.77	384.55	-154.78***	
Average Order Price (GHC)	8.21	8.62	-0.41	14.06
Average Order Expense (GHC)	3.95	3.75	0.20	6.75
Total # Orders	53.86	78.95	-25.10***	68.84
Number of Firms	135	66		

Note: Firms included in this sample are those who were operating every week of the 7 week data collection.

Table 6: Profit Deconstruction - Similar Reason For Self-Employment

	Women	Men	Diff in Means	Percent of Profit Gap Explained
Total Profits (GHC)	167.44	367.41	-199.97***	
Average Order Price (GHC)	7.75	8.69	-0.94	20.20
Average Order Expense (GHC)	3.87	3.67	0.2	4.25
Total # Orders	43.12	73.23	-30.11***	58.35
Number of Firms	179	73		

Note: Firms included in this sample are those who did not say the ability to watch their children was a very important reason for self-employment.

Table 7: Market Research Survey by Gender of Firm Owner

	Female Owned		Male Owned		Diff in	
	Mean	N	Mean	N	Means	T-Stat
=1 if customer female	0.83	761	0.12	489	0.71	34.04
Age of customer	30.75	760	31.85	487	-1.1	-2.01
Customer makes no income	0.19	761	0.2	489	-0.01	-0.26
Customer is salary employee	0.19	761	0.25	489	-0.06	-2.44
Customer is wage employee	0.13	761	0.15	489	-0.02	-1.09
Customer is self employeed	0.45	761	0.35	489	0.1	3.47
Customer is farmer or fisherman	0.04	761	0.05	489	-0.01	-0.77

Table 8: Barriers to Business Growth

	Female Owned		Male Owned		Diff in	
	Mean	N	Mean	N	Means	T-Stat
Not enough customers	0.57	289	0.42	88	0.15	2.49
Not enough access to cash/savings	0.49	289	0.48	88	0.01	0.23
Supply problems - water/electricity	0.44	289	0.55	88	-0.11	-1.75
Customer Default	0.33	289	0.48	88	-0.15	-2.49
Not enough apprentices	0.25	289	0.26	88	-0.01	-0.16
Customers Do Not Pay On Time	0.09	289	0.06	88	0.03	0.99
Not enough access to credit	0.07	289	0.08	88	-0.01	-0.33
Not enough time	0.06	289	0.06	88	0	-0.05
Supply problems - materials	0.04	289	0.14	88	-0.09	-3.05
Inflation/Price uncertainty	0.04	289	0.06	88	-0.02	-0.6

Table 9: Demand Shock Displacement by Gender

	(1)	(2)	(3)
	Non Exp. Sales	Non Exp. Sales	Non Exp. Sales
Male	185.0***	192.2***	195.6***
	(28.83)	(28.79)	(32.37)
Demand Size	-1.413		
	(3.999)		
Male * Demand Size	-13.52*		
	(8.109)		
Demand Size Accepted		-1.419	
		(5.626)	
Gender * Demand Size Accepted		-17.27*	
		(10.17)	
Experimental Sales			-0.126
			(0.365)
Male * Experimental Sales			-1.848*
			(1.024)
Constant	126.3***	127.2***	126.1***
	(14.17)	(14.18)	(14.07)
N	383	363	383

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$