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# IT'S GETTING CROWDED IN HERE: EXPERIMENTAL EVIDENCE OF DEMAND CONSTRAINTS IN THE GENDER PROFIT GAP

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**MOST RECENT VERSION**

**Abstract**

This paper highlights the importance of considering market-level contributors to the gender profit gap; self-employed women may be relatively demand constrained. In a study of Ghana's bespoke garment making industry, we combine a firm census with a market research survey to uncover a large gender gap in the market-size-to-firm ratio. Additionally, female firm-owners disproportionately self-report a lack of customers as a key barrier to business success. As experimental corroboration, we show that female-owned firms expand production to accommodate random demand shocks, but male-owned firms experience large production displacement. Nationally representative data echoes this finding, showing more crowding in female-dominated industries.

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# 1 Introduction

Understanding barriers to the economic empowerment of women is of primary importance within any country's path toward development (Duflo, 2012). In low-income countries, micro-entrepreneurship is a common and growing form of employment and often a woman's only alternative to agriculture for work outside of the home (Hallward-Driemeier, 2013; Gindling and Newhouse, 2014; Calderon, Iacovone and Juarez, 2016). Similar to the gender wage gap found in high-income countries (Blau and Kahn, 2017), female-owned micro-enterprises in low-income countries earn less than those owned by men (Klapper and Parker, 2010; Bardasi, Sabarwal and Terrell, 2011). In other words, female entrepreneurs experience a gender profit gap.

We know that micro-enterprises owned by men and women are different along a number of dimensions (Nichter and Goldmark, 2009). However, much of the gender profit gap is unexplained by industry, firm and firm-owner characteristics.[1] Why the gender profit gap in micro-enterprises persists, even after controlling for observable firm and firm-owner characteristics, and what can be done to reduce the gap remains an unanswered and important research question.

A large body of literature has explored interventions that adjust the inputs of production in hopes of improving micro-enterprise performance.[2] Numerous experiments have shown that male and female firm owners respond differently to interventions aimed at easing constraints within the production function. Specifically, female firm owners do not reap the same benefits that male firm owners do from financial (De Mel, McKenzie and Woodruff, 2009) and human capital (Berge, Bjorvatn and Tungodden, 2014) interventions.[3] It has been shown that female-owned firms respond more to in-kind capital grants than cash (Fafchamps et al., 2014) and that business capital grants are less effective if a woman's husband also owns a business (Bernhardt et al., 2017). However, the reason for this heterogeneous response is still an open puzzle, as is how to best improve the

[1] Nix, Gamberoni and Heath (2015) show the majority of the gender profit gap is not explained by differences in owner characteristics (marital status, experience, education, number of children, average monthly hours worked) and broadly defined firm industry. In a related paper, using data from Ghana's garment making industry, Hardy and Kagy (2018) find the gender profit gap remains large and unexplained, even after controlling for cognition of the firm owner, firm productivity, reasons for self-employment, and product quality, in addition to the previously considered firm and firm owner characteristics.

[2] Seminal papers consider capital constraints (De Mel, McKenzie and Woodruff, 2008), savings constraints (Dupas and Robinson, 2013), and managerial ability (Bloom et al., 2013). Reviews of this literature can be found in: Banerjee (2013) and Banerjee, Karlan and Zinman (2015) which summarizes the findings of the impact of micro-credit; McKenzie and Woodruff (2013) summarizes the impact of business training programs, Grimm and Paffhausen (2015) synthesizes the findings of the impact of micro-enterprise interventions on job growth.

[3] See Campos and Gassier (2017) for a comprehensive review of the literature.

performance of female-owned micro-enterprises.

In contrast to the large and growing body of literature exploring input-focused interventions, literature exploring the effectiveness of demand-focused interventions on micro-enterprise performance is scant.[4] This paper is the first to test for differences in female-owned and male-owned firm responses to a demand-focused intervention. That is, this paper considers a new factor possibly holding the self-employed women of the developing world back: relative demand scarcity.

We examine demand scarcity both descriptively and experimentally, using data representing the universe of garment-making firms from the mid-sized district capital of Hohoe, Ghana. Using the same sample of firms in Hardy and Kagy (2018), we document a large and robust gender profit gap, where male garment making micro-enterprise owners earn almost double the profits that their female counterparts do. This gender profit gap is not explained by a plethora of firm and owner level characteristics, compelling us to consider potential market level factors.

We first combine our firm census and market research survey to calculate back of the envelope market-size-to-firm ratios for male and female firm owners. We know from our firm census that there are three times as many female-owned firms in the market as male-owned firms. We also learn through our market research survey that female customers typically buy from female-owned firms while male customers typically buy from male-owned firms, creating gender segregation in the market for demand. Importantly, women also order approximately the same number of garments as men.[5]

Taken together, these facts imply a much lower market-size-to-firm ratio for female-owned firms in this context. This implication is consistent with self-reports from our sample, in which women garment making micro-enterprise owners' most common barrier to business growth is lack of customers, while male firm owners most commonly report input-focused constraints. This descriptive evidence leads us to develop a simple model, allowing for demand scarcity (and not just the more commonly studied input scarcity) to limit profitability of the firm.

To experimentally corroborate this descriptive evidence and model, we exploit a random demand shock on these garment making firms and compare the response by firm owner gender. We see that male-owned firms decrease their usual production in response to experimental order offers and

[4] In a recent exception, Atkin, Khandelwal and Osman (2017) randomly vary access to export markets, finding increases in firm profits and product quality.

[5] Women in our random customer sample ordered only approximately 1 more garment in the last year than men.

completion, while female-owned firms accommodate these new orders without displacement. We also see that female-owned firms increase wages and input expenses in response to the demand shock, while male-owned firms do not. Ultimately, these experimental demand shocks increase both sales and profits for female-owned firms, but do not effect sales or profits for male-owned firms. This difference in results suggests that, during the order period, male-owned firms were producing at capacity, while female-owned firms had the capacity to produce more than was being demanded by the baseline market.

To gain insight about why female garment makers remain in such a highly crowded industry relative to men, we use the Ghana Living Standards Survey (GLSS), a nationally representative repeated cross-section, to investigate their outside options. We document three findings that hold true across all five rounds of the GLSS from 1987/1988 through to the most recent survey in 2012/2013. First, we re-confirm the well known fact that working women are more likely to be in self-employment than men. Second, we show that, even within self-employment, women are working in fewer industries than men. Finally, we document that the industries in which these self-employed women are working are more crowded than those occupied by self-employed men. This implies that, on average, employment opportunities available to women are more crowded than those available to men. The women in our sample may be choosing to enter into, and remain in, a market with such a low market-size-to-firm ratio relative to men, because there is no market available to them in which the ratio is more favorable.

This paper proceeds as follows: In Section 2, we describe the context and sample. In Section 3 we describe the design of the experiment and the data collected. In Section 4, we model demand constrants and present findings from the experiment where we randomly increased the number of garment orders. In Section 5, we present analysis using the nationally representative GLSS showing more crowding for females in our sample and, more generally, in female-present industries nationwide. Section 6 concludes.

# 2 Project Background and Summary Statistics

## 2.1 Ghanaian Context

In this paper, we analyze the impact of random demand shocks on the gender profit gap of micro-enterprises in the garment making industry in Ghana. Our study takes place in the mid-size district capital of Hohoe, Ghana. Hohoe District borders Togo and is considered a middle-income district by Ghanaian standards.[6]

The Ghanaian garment making industry has several salient characteristics that are similar to other micro-enterprises in developing countries. First, Ghanaian garment making firms are of small-scale and typically have no paid employees besides the owner. Second, they require minimal capital investment, using only simple production technology.[7] Third, these microenterprises are ubiquitous and produce similar products.[8] Demand for garments comes almost exclusively from the local population, as garments are individualized and made to order.

A key characteristic of micro-enterprises in the garment making industry in Ghana is that firms are owned by both men and women. It should be noted that firms owned by men and women make arguably different products, on average. The most commonly produced garment for female-owned firms is Slit and Kabbah (traditional Ghanaian skirt and top for women), while male-owned firms most commonly produce men's shirts. However, the production function components required for these products are identical, making this within industry comparison closer than a broader comparison across industry.[9]

## 2.2 The Hohoe Garment Maker Study

The Hohoe Garment Maker Study (HGMS) began with a project census identifying all garment making firms in Hohoe town and surrounding suburbs. To ensure that all firms in the town were included in the study, field staff 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

[6] The district had a population of 73,641 in 2010.

[7] In this context, a mixture of human powered and electrically powered sewing machines are used to produce garments.

[8] The most common garments are men's shirts and slit and kabbah (traditional Ghanaian skirt and top for women).

[9] This low overlap in products does, however, make directly measured price comparisons less useful in this context. A simple theoretical structure, described below in Section 3, allows us to abstract away from direct price measurement.

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. We consider this the universe of garment making firms in Hohoe, in 2014.[10]

### 2.3 Experiment Sample

There were 322 firms owned by women and 95 firms owned by men, 417 in total, confirmed to be still operational as of June 2015, the time of our experiment.[11] Of these, we were able to implement an experimental demand shock and follow-up survey on 383 (291 female-owned and 92 male-owned) firms. The majority of the 34 firm owners missing in our experiment sample had travelled temporarily during the period of fieldwork, a reason that we argue is more or less random. Table A.1 shows a test for differences on observable characteristics between our sampling frame and our experiment sample. We find no significant differences on observables, nor order treatment assignment, and an overall F-Stat of Joint Significance of .03, indicating that attrition is as good as random.

The sampling frame of this paper is the same as the sampling frame considered in Hardy and Kagy (2018), which documents the gender profit gap and describes firm and firm owner characteristics separately by gender of firm owner. For reader convenience, the paragraphs below summarize that discussion.[12]

Firms owned by men are significantly more profitable than those owned by women, with male-owned firms making nearly twice as much profit on average. Male owned firms are also older, have more assets, and the firm owners work longer hours. However, firms owned by men and women have similar levels of productivity, as measured by the typical time it takes to make a garment.

Men and women firm owners are similar along several demographic dimensions. The men and women are equally likely to be married, have similar levels of education (approximately 9 years), and similar levels of cognitive functioning.[13] For both men and women the garment making firm

[10] We use firm owner as the unit of measurement instead of firm. The 12% of our sample that co-own are able to easily divide expenses and revenues.

[11] This gender imbalance in firm owner within an industry is common in Sub-Saharan Africa, as many industries with micro-enterprises are heavily - or exclusively - dominated by one gender (Bardasi, Sabarwal and Terrell, 2011). While the garment making industry is dominated by female-owned firms, we know from geocoded data collected as part of the HGMS that firms owned by men and women are located in the same areas in Hohoe.

[12] For the original discussion and documentation of our sample characteristics, see Sections III and Table 1 of Hardy and Kagy (2018).

[13] Cognitive functioning is measured by the Ravens Matrix Reasoning Test.

is their primary economic activity. While men are more likely to also engage in farming, women are more likely to have an additional retail business creating a similar level of additional economic activity between men and women.

The gender profit gap seen in the garment makers of Hohoe remains large, and of a similar 2:1 magnitude, even when firm owner characteristics, cognition of the firm owner, firm characteristics, productivity measures, reasons for self-employment, and product quality are accounted for. Even with the inclusion of all of these detailed observable characteristics the gender profit gap remains sizable and robust (Hardy and Kagy, 2018).

# 3 Descriptive Evidence

## 3.1 Market Level

We thus turn our attention to investigating other potential contributors to the gender profit gap. Our census and market research survey data[14] point to a particularly compelling reason for this difference in profit. We find a large gap in the firm-to-market ratio by gender in our context.

From our firm census, we know that there are over three times as many female firm owners in the market than male firm owners (321 versus 95) in Hohoe. This translates into a supply of garment firms that is 77% female. Importantly, from our market research survey, we know that demand is segregated based on gender.[15] Additionally, customers from female-owned firms order only approximately one more garment per year than male-owned firm customers.[16] Given the much larger share of female-owned firms, and approximately equal amount of men and women in Hohoe, the gender segregation in demand market, and the only slightly higher level of demand by women, we are left with a large gap. A female-to-male firm ratio of 3, combined with a female-to-male demand market ratio of 1.5, means a female-to-male firm-to-market ratio of 2.

[14]The market research survey was conducted in March and April of 2015. In the market research survey, nearly 1,600 Hohoe individuals were interviewed. Respondents reported how much and how often they buy from garment makers, which specific garment makers they purchase from, and reasons for buying from that specific firm. The survey allows us 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.

[15]From our market research survey, we calculate that 83% of customers at female-owned firms are female, while only 12% of customers at male-owned firms are female.

[16]The average number of garments ordered for women we interviewed was 4.1, while the average for men was 2.7.

### 3.2 Self-report

Next, we examine the self-reported business barriers of the firm owners. As part of our firm baseline, firm owners were asked what are the three largest barriers to growth in their businesses. Table 1 breaks down the responses by gender. The most common barrier to growth for female owners was not having enough customers. 57% of female owned firms cited lack of customers as a barrier to growth, while only 42% of male owned firms did.[17] The most common barrier to growth for male owners was supply side related, in lack of supply of electricity and water. These self reports are consistent with the behavior of male- and female-owned firms during our experiment. We are left to believe that, at least part of, the gender profit gap is driven by differences in access to customers by gender.

## 4 Experiment Framework, Design, and Data

### 4.1 A Simple Model of Demand Constraints

We start this section with a simple model of production output, allowing for either demand constraints ($d$) or input constraints ($i$) to bind. Where $m$ denotes male and $f$ denotes female, let male-owned firm production be:

$$q_m = min(d_m, i_m^\alpha) \tag{1}$$

and female-owned firm production be:

$$q_f = min(d_f, i_f^\alpha) \tag{2}$$

Let $c$ be the cost of each input, $i_m$ or $i_f$, $p$ be the prices that each firm can sell $q_m$ or $q_f$, and $\alpha$ be the the output elasticity of each input, $i_m$ or $i_f$.

Input-focused interventions consider the idea that $i_m$ and $i_f$ are constrained by some $\bar{i}$. In this paper, we are considering the idea that, $d_f < \bar{i}^\alpha < d_m$; that is, we are considering the idea that female-owned firms' more pressing constraint is $d_f = min(d_f, i_f^\alpha) = q_f$, while male-owned firms'

[17] The World Bank Enterprise Surveys do not typically include access to customers as an option to be self reported, so we are unable to compare these rates with those from nationally representative surveys.

are limited by $\bar{i}^{\alpha} = min(d_m, \bar{i}^{\alpha}) = q_m$.

Now, suppose there is a new source of demand, $d_e$, which pays $p_e \sim p$ for $q_e$. This means that male-owned firm production now looks like the following:

$$q_m + q_e = min(d_m + d_e, i_m^{\alpha}) \tag{3}$$

and female-owned firm production now is as follows:

$$q_f + q_e = min(d_f + d_e, i_f^{\alpha}) \tag{4}$$

Because $\bar{i}^{\alpha} < d_m$, adding $d_e$ to $d_m$ would not increase the input-constrained $q_m + q_e = \bar{i}^{\alpha}$ for male-owned firms. Male-owned firms may weakly prefer to sell their output to the new demand source, but any production of $q_e$ will reduce $q_m$ by an equal portion and would not result in any increase in overall output (constrained at $\bar{i}^{\alpha}$), costs ($c_m * \bar{i}$), or profits ($p_e * d_e + p * [\bar{i}^{\alpha} - d_e] - c * \bar{i}$).

Female-owned firm output, on the other hand, would increase to their new minimum: $d_f + d_e \leq \bar{i}^{\alpha}$.[18] Female-owned firm expenses would increase ($c * [d_e + d_f]^{1/\alpha} > c * d_f^{1/\alpha}$) and so would female-owned firm profits ($p * d_f + p_e * d_e - c * [d_e + d_f]^{1/\alpha} > p * d_f - c * d_f^{1/\alpha}$)

This difference in response by firm-owner gender to exogenous demand increases is exactly what we see in our experiment.

## 4.2 Experiment Design

As part of an earlier experiment designed to study technology diffusion between industry peers, two things were randomly offered to garment making firm owners in Hohoe, Ghana: (1) an invitation to learn a new design technique to be used on garments[19] and (2) demand for garments with the new design. Both randomizations were stratified by gender.

In early March of 2015, approximately 15% of the sample were invited to attend a government training on the new design technique. Invited women and men showed up to this training at an

[18] Note that this assumes this new demand is such that $d_e + d_f$ is still $\leq \bar{i}^{\alpha}$, an assumption that is reasonable in our experiment given the size of the demand shock relative to the gap in output between female and male-owned firms.

[19] The new design was commissioned specifically for the original experiment. It is unisex and appropriate for use in both male and female clothing. Execution of the design requires no electricity. The only capital required is a deconstructed common children's toy car easily found in local markets for 5 GHS (approximately 1.1 USD). Additional details the technology can be found in Hardy and McCasland (2016).

equally high rate of 93%. All those invited to the one-day training mastered the technique.

After lower than expected demand for this new technique, the experimenters indroduced experimental demand for garments featuring the technique.[20] In June of 2015, firms were randomized to receive a demand shock of either 0, 1, 4, or 10 garments that used the new design technique. The price offered for each garment was fixed at 35 GHS, the going price in the market for a shirt with a complex design feature. Approximately 50% of the sample received an order size of 1, 20% received an order size of 4, and approximately 10% received an order size of 10.[21] Baseline characteristics are balanced, for both male and female firm owners, for the demand shock randomization.[22]

### 4.3 Data

Our self-collected data comes from three sources: (1) a firm census and baseline survey done prior to randomization, (2) a detailed follow-up survey measuring firm inputs and outputs during the time of the random demand shock, and (3) a market research survey conducted in the weeks leading up to the demand shock.

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, information about the firm's assets, workers, previous month's sales, expenses, profits, and productivity measures.

At the time of the experimental demand shock in June of 2015, 417 of the original 445 firm owners were still in operation. As noted in section 2.3 the experiment was conducted on 383 of these 417 firms. Follow-up data collection obtained information from each firm owner about both experiment specific and other sales, expenses, and garments produced for the two weeks directly after the experimental demand shock.

[20] The original experiment was registered with the American Economics Association (AEA) Randomized Controlled Trial Registry, complete with a Pre-Analysis Plan (PAP). Because demand was meant to be naturally generated, this PAP did not include random demand for the design, which was inspired partway through implementation as a result of iterative fieldwork lessons. This paper does not have a PAP, as the question and resulting analysis plan were conceived after the design, collection, and analysis of data for the originally intended purpose.

[21] The size of these orders respectively correspond to the median, 90th percentile and 99th percentile of a firm's weekly sales in the sample.

[22] Tables A.2 and A.3 show the baseline characteristic balance checks for the demand shock randomization by gender. The F-Stat of Joint Significance on the 24 baseline observables is 1.38 for the female sample and 1.08 for the male sample, indicating balance on observables by treatment group within gender.

# 5 Experimental Findings

## 5.1 Experimental Demand Displaces Other Demand in Male-owned Firms

Panel A of Table 2 shows the Intention-to-Treat (ITT) estimates, depicting the effect of a random garment order offer on experimental garment orders completed according to our administrative data (compliance), as well as non-experimental orders and non-experimental sales, reported in our survey data.[23] Panel B of Table 2 shows Treatment-on-the-Treated (TOT) estimates, depicting the effect of a random increase in experimental orders completed on non-experimental orders and non-experimental sales.[24]

Men and women's non-experimental orders and sales do not respond in a similar way to an experimental order offer. An experimental order offer does not reduce non-experimental orders or non-experimental sales in female-owned firms, Panel A Columns 3 and 5, indicating that they are able to accommodate the increased demand for garments. In contrast, Columns 4 and 6 of Panel A shows that for each experimental order offered, male-owned firms significantly reduce non-experimental orders completed by 1.5 garments and non-experimental sales by 14.12 GHS (slightly less than half the sale price for each experimental order).[25] Overall, we see a statistically significant difference in response between male-owned and female-owned firms to the increases in the number of orders offered that suggests female owned firms have the capacity to take on additional orders while male owned firms experience displacement in order to accommodate additional orders.

It should be noted from Panel A, Columns 1 and 2, that men are more likely than women to complete a randomized order if offered. Although this difference is not statistically significant, it is necessary to understand any gender differences in non-compliance when interpreting the TOT results. The most common reason men refused to accept the experimental order was because they were too busy, while women more commonly refused the order because of difficulty (Subfigure (a) of Figure A.1). Additionally, men and women who were offered training on the new technique were equally likely to accept the experimental order offer, with the difference in acceptance by gender

[23] The ITT regression specification to calculate the difference between men and women is as follows: $Y_i = Male_i + OrderSize_i + Male * OrderSize_i + \epsilon_i$, where $i$ represents the firm, and Y is the outcome of interest. Standard errors are clustered at the firm level.

[24] To estimate TOT effects the random assignment of order size is used to instrument for number of experimental orders completed.

[25] This "larger than 1-to-1" reduction is likely due to a higher complexity (but higher sales price) of our orders to the average firm's market order.

only arising in the group not offered this training (Subfigure (b) of Figure A.1). Ultimately, these patterns in compliance indicates that the Local Average Treatment Effects of the TOT will be estimated on relatively less busy male-owned firms and relatively more entrepreneurial (and likely more busy) female-owned firms.

The TOT estimates show that the displacement of non-experimental orders and sales experienced by male owners grows larger in magnitude compared to the ITT estimates. Male owned firms decrease their non-experimental orders by 1.8 garments for each experimental order completed, and their non-experimental sales by 17.07 GHS for each experimental order completed (Table 2, Panel B, Columns 4 and 6). These effects are statistically significant at the one percent and five percent level, respectively. The TOT estimates show no statistically significant displacement for women in non-experimental orders and sales when an experimental order is completed (Table 2, Panel B, Columns 3 and 5).

### 5.2 Only Female-owned Firms Expand Production for Demand Shocks

We unpack this significantly different response to experimental demand shocks by gender in Table 3 by considering the following components of production: labor expenses (wages), input costs, outsourcing fees, and owner hours. Again, we present both the random assignment of demand shocks results in Panel A (ITT) and the completion of the demand offer (TOT) results in Panel B. Columns (1) and (3) of Panels A and B show significant increases in both labor and input expenses paid by female-owned firms in response to increases in both order offers and order completion. In contrast, Columns (2) and (4) show no significant evidence of production input expansion for male-owned firms. In comparison, female-owned firms increase wages by 1.40 GHS and 2.05 GHS more than male-owned firms per order assigned and completed, respectively. Similarly, female-owned firms increase input spending by 2.83 GHS and 3.89 GHS more than male-owned firms per order accepted and completed, respectively. Neither gender of firm owner increases production through increases in owner labor, nor increases in outsourcing fees (Columns 5 - 8) indicating that female- and male-owned firms both handle the experimental increase in demand "in house".

Taken together, Table 3 indicates that female-owned firms expand production through increases in both labor and capital inputs in response to demand shocks. This response is not consistent with a theory that female-owned firms were previously operating at their production capacity. Male-

owned firms, on the other hand, display behavior consistent with the constraints more commonly studied in the micro-enterprise barriers literature, where they are either unable or unwilling to increase capital and/or labor inputs to expand production and absorb new demand.

### 5.3 Demand Shocks Increase Profits Only in Female-owned Firms

Table 4, shows gender differences in the total sales and firm profits response to random demand shocks. Columns (1) and (2) of Panel A show a statistically significant increase of 9.65 GHS in total sales and 7.618 GHS in total profits in female-owned firms for each random garment order offered. The effect of completing orders appears larger, at 15.42 GHS increase in total sales and 12.17 GHS increase in total profits for each order completed in female-owned firms (Panel B: TOT). In contrast, we cannot detect a change in either total sales or total profits in male-owned firms in response to orders assigned or completed.

## 6 It's Getting Crowded in Here

Why might women opt for employment in such a crowded market? Why wouldn't rationally optimizing women exit toward relatively less crowded employment opportunities, equalizing the firm-to-market ratio? In this section, we turn to The Ghana Living Standards Survey (GLSS) to explore what a Ghanaian women's outside employment options are.[26]

Subfigure (a) of Figure 1 shows us the percent of working adults in different types of employment by gender. We group employment into three categories: non-agricultural paid employment, non-agricultural self-employment, and agriculture (both self and paid). In the GLSS, women employed outside of agriculture are more likely to be in self-employment than men employed outside of agriculture, across all rounds of the GLSS from 1987 to 2012. Potential reasons for this gender segregation are numerous. They include differences in responsibilities within the home, mobility, and motivations for self-employment (Bardasi, Sabarwal and Terrell, 2011). However, these potential reasons are not the focus of this paper. Instead, we are interested in the consequences of gender differences in employment patterns.

[26]The GLSS is a nationally representative repeated cross-section. It includes questions about employment status, both in terms of sector and industry. We use all five rounds of the GLSS from 1987 - 2012.

The difference in employment patterns does not stop with sector of employment.[27] Subfigure (b) of Figure 1 shows that (non-agriculturally) self-employed men report employment in a greater number of industries than (non-agriculturally) self-employed women, across all rounds of the GLSS. Subfigure (c) of Figure 1 displays the natural result of this higher number of self-employed women squeezing into fewer numbers of industries: crowding within industry. This figure graphs the average number of other people reporting employment within a respondents' industry of employment, by gender. The industries in which the average (non-agriculturally) self-employed female is employed are approximately three times as crowded as the industries in which the average male is (non-agriculturally) self-employed for 2012/2013.[28]

It should be noted that, in this nationally representative data, we do not have a market research survey like the one we conducted in Hohoe. Thus, we are not able to calculate nationally representative back of the envelope firm-to-market ratios. However, the fact that the supply-side "crowding" component of localized calculations is consistent throughout Ghana and across decades is compelling. Facing this stylized fact, one might find it less surprising that female garment making firm owners in Hohoe have opted into employment that is nearly three times as crowded as their male counterparts. The grass may not be greener on the other side, at least not on the other side accessible to women.

# 7 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 robust 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.

Production constraints, such as access to credit, have historically been the focus of both researchers and policy makers. This paper provides evidence pointing to an under-considered side of

[27] In this figure, we use four digit industry codes and have 245 unique industries. In Nix, Gamberoni and Heath (2015), whom also use the GLSS, they categorize 10 unique broader industries. Their industries are: agriculture/fishing, mining/energy, manufacturing, construction, wholesale/retail, trade, finance, public services, and other.

[28] Industry concentration and segregation for women, similar to what we find using the GLSS, has also been found in a broader array of contexts in Latin America, other countries in Sub-Saharan Africa and East and Central Asia (Bardasi, Sabarwal and Terrell, 2011).

the story: demand constraints. We show experimental evidence that female-owned firms expand production to absorb random demand shocks, while male-owned firms to not.[29] We show descriptive evidence from self reports that access to customers is female firm-owner's most common barrier to business growth in this context. We go on to provide compelling stylized facts, both within our context and on a nationally representative level, that self-employed women are operating in more crowded markets than self-employed men.

Taken together, the evidence presented in this paper is inconsistent with the argument that factors affecting the production function, such as access to credit and capital, are the binding constraint for increasing female-owned micro-enterprise profits in this context. Rather, it supports an alternative explanation: limited formal employment opportunities for women in developing countries causes a relative oversupply of female micro-entrepreneurs. Even within self-employment, women are limited in the work they can do, causing further crowding in female-present industries.[30] This crowding 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.

This explanation sheds new light on the inconsistent impacts of input focused interventions on female-owned firms. For input focused interventions to be effective, women must not face binding demand constraints. Similar to an argument made in Atkin, Khandelwal and Osman (2017), demand focused interventions may be complementary to input constraint focused interventions in the quest to improve women's economic empowerment. Our findings suggest the need for future research on, and design of, demand-focused interventions for female-owned micro-enterprises.

Furthermore, this explanation highlights the need to better understand the reasons behind sector and industry choice by gender. It compels a policy focus on increasing alternative employment opportunities for women in the developing world. Meaningfully increasing the option set for women

[29] It should be noted that our experimental findings do not speak to the inter-temporal nature of constraints on production. It is possible that the expansion we see in production from female-owned firms who received a positive demand shock, could not be sustained for long-term increases in demand. Understanding exactly how much extra demand female-owned firms need, and how they respond to longer term demand shocks is a key area for future research. However, we argue that, regardless of the amount of and length of slack in women's production functions, women are not fitting the typical capital and managerial constraint story more commonly considered in this literature. These results, though short-run, compel the consideration of demand constraints as a potential barrier to the success of female firm owners.

[30] A similar form of segregation has even been found in agriculture, where women do not participate in commercial or export production (Croppenstedt, Goldstein and Rosas, 2013).

entering the labor force will reduce crowding in the markets in which they ultimately operate.[31] This decrease in crowding may see large impacts on the welfare of women and is largely ignored in comparison to the micro-credit or skill training's more commonly supported by governments.

[31]For example, Campos et al. (2017) shows that women who enter male-dominated forms of employment earn just as much as men.

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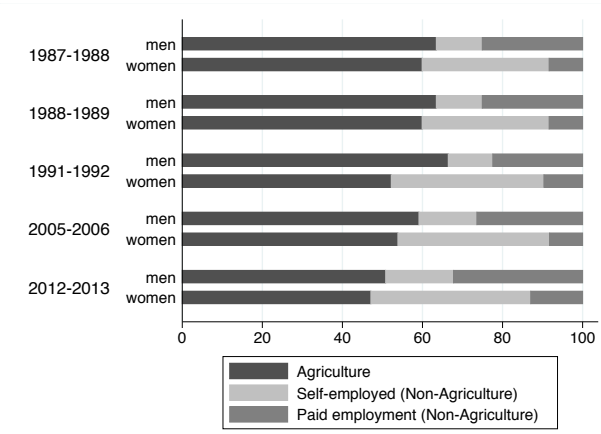
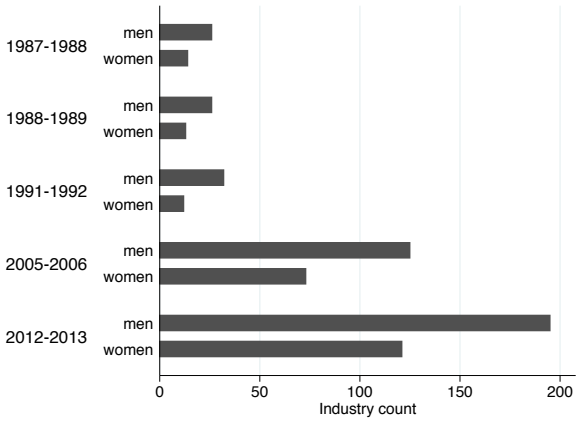
Figure 1: **Crowding by Industry in Ghana**

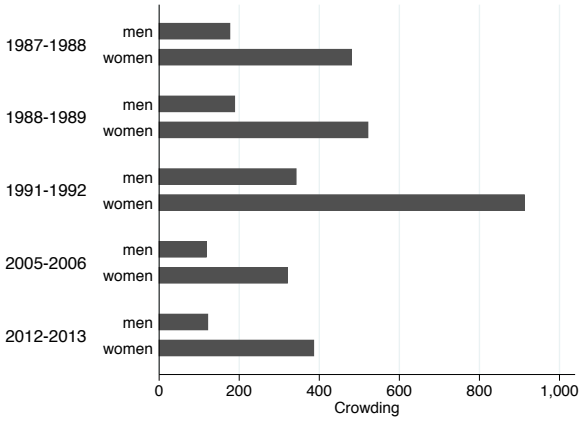
Using five rounds of the nationally representative Ghana Living Standards Survey, this figure depicts the percent of adult men and women in different employment categories (Sub-figure A), the total number of industries reported by non-agriculturally self-employed men and women (Sub-figure B), and the average number of other respondents reporting employment in a non-agriculturally self-employed men and women respondent's own industry. Individuals age 18 and older are included. Four digit industry codes are used for Sub-figures B and C.




(a) Employment Category




(b) Number Industries Reported by Non-Agriculture Self-Employed




(c) Average number of other people with employment in same industry (non-agricultural self-employed)

Table 1: Descriptive Statistics

This table reports summary statistics on reported barriers to business success for firms owned by men and those owned by women. The mean is presented, with the standard error in parentheses. The third column gives the difference between men and women. Standard errors are clustered at the firm level. *** p<0.01, ** p<0.05, *p<0.1.

| | Men | Women | Difference |
|---|---|---|---|
| **Reported Barriers to Business Success** | | | |
| Not enough customers | 0.43 | 0.57 | -0.14 |
| | (0.50) | (0.50) | (0.06)** |
| Not enough time | 0.06 | 0.04 | 0.01 |
| | (0.23) | (0.21) | (0.03) |
| Not enough access to cash/savings | 0.48 | 0.50 | -0.02 |
| | (0.50) | (0.50) | (0.06) |
| Not enough access to credit | 0.08 | 0.07 | 0.01 |
| | (0.27) | (0.25) | (0.03) |
| Not enough apprentices | 0.26 | 0.26 | 0.01 |
| | (0.44) | (0.44) | (0.05) |
| Supply problems - materials | 0.14 | 0.04 | 0.09 |
| | (0.35) | (0.21) | (0.04)** |
| Supply problems - wager/electricity | 0.55 | 0.45 | 0.11 |
| | (0.50) | (0.50) | (0.06)* |
| Observations | 92 | 291 | 383 |

Table 2: Effect of Experimental Demand on Orders and Sales

This table reports Intent-to-Treat and Treatment-on-the-Treated Effects of the random number of garments ordered on orders and sales two weeks after the experimental order was made. Orders and sales are broken down into experimental and non-experimental components. For the Treatment-on-the-Treated Effects the random assignment of order size is used as an instrument for order size accepted. Standard errors are clustered at the firm level. *** p<0.01, ** p<0.05, *p<0.1.

| | Experimental Orders | | Non-Experimental Orders | | Non-Experimental Sales | |
|---|---|---|---|---|---|---|
| | Women | Men | Women | Men | Women | Men |
| Panel A: ITT | (1) | (2) | (3) | (4) | (5) | (6) |
| Order Size | 0.62*** | 0.83*** | -0.32 | -1.52*** | -1.47 | -14.13** |
| | (0.09) | (0.11) | (0.21) | (0.47) | (3.20) | (6.86) |
| Constant | 0.01 | -0.18 | 11.46*** | 25.42*** | 124.27*** | 301.67*** |
| | (0.11) | (0.15) | (0.86) | (2.63) | (10.54) | (36.16) |
| Difference | 0.20 | | -1.20** | | -12.66* | |
| (Men - Women) | 0.14 | | 0.51 | | 7.54 | |
| Observations | 291 | 92 | 291 | 92 | 291 | 92 |
| Panel B: TOT | (1) | (2) | (3) | (4) | (5) | (6) |
| Order Size | | | -0.51 | -1.84*** | -2.34 | -17.07** |
| | | | (0.35) | (0.60) | (5.17) | (8.18) |
| Constant | | | 11.47*** | 25.09*** | 124.29*** | 298.58*** |
| | | | (0.86) | (2.57) | (10.59) | (35.14) |
| Difference | | | -1.33* | | -14.73 | |
| (Men - Women) | | | 0.69 | | 9.64 | |
| Observations | 291 | 92 | 291 | 92 | 291 | 92 |

Table 3: Effect of Experimental Demand on Firm Expenses and Owner Hours

This table reports Intent-to-Treat and Treatment-on-the-Treated Effects of the random number of garments ordered on the number of hours worked by the owner, wages paid to other workers, input costs and outsourcing fees, two weeks after the experimental order was made. For the Treatment-on-the-Treated Effects the random assignment of order size is used as an instrument for order size accepted. Standard errors are clustered at the firm level. *** p<0.01, ** p<0.05, *p<0.1.

| | Wages | | Input Costs | | Outsourcing Fees | | Owner Hours | |
|---|---|---|---|---|---|---|---|---|
| | Women | Men | Women | Men | Women | Men | Women | Men |
| Panel A: ITT | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Order Size | 0.94* | -0.46 | 1.19* | -1.63 | -0.10 | 0.06 | 0.49 | -0.87 |
| | (0.54) | (0.52) | (0.71) | (1.36) | (0.08) | (0.12) | (0.63) | (1.29) |
| Constant | 4.27*** | 7.75*** | 23.61*** | 46.05*** | 1.95*** | 1.30*** | 71.34*** | 94.73*** |
| | (1.51) | (2.42) | (2.36) | (8.68) | (0.44) | (0.49) | (2.58) | (4.55) |
| Difference | -1.40* | | -2.83* | | 0.17 | | -1.36 | |
| (Men - Women) | 0.75 | | 1.53 | | 0.15 | | 1.43 | |
| Observations | 291 | 92 | 291 | 92 | 291 | 92 | 291 | 92 |
| Panel B: TOT | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Order Size | 1.50* | -0.55 | 1.91* | -1.97 | -0.16 | 0.08 | 0.79 | -1.05 |
| | (0.82) | (0.64) | (1.05) | (1.73) | (0.13) | (0.14) | (0.96) | (1.57) |
| Constant | 4.26*** | 7.65*** | 23.60*** | 45.69*** | 1.95*** | 1.32*** | 71.33*** | 94.54*** |
| | (1.50) | (2.34) | (2.33) | (8.46) | (0.44) | (0.48) | (2.57) | (4.41) |
| Difference | -2.05** | | -3.88* | | 0.24 | | -1.83 | |
| (Men - Women) | 1.04 | | 2.01 | | 0.20 | | 1.83 | |
| Observations | 291 | 92 | 291 | 92 | 291 | 92 | 291 | 92 |

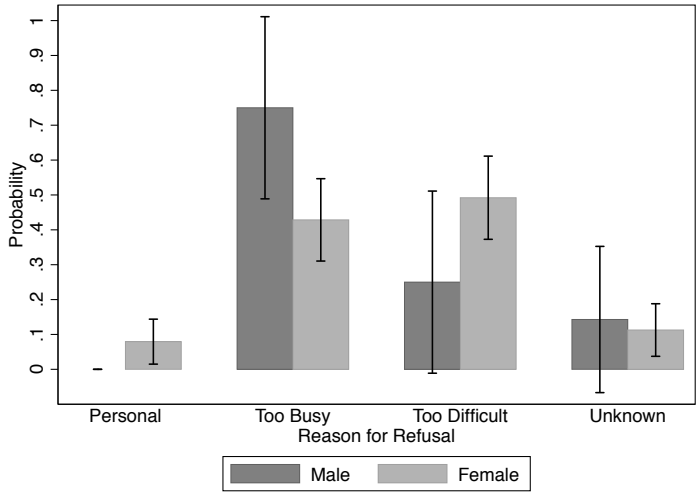
Table 4: Effect of Experimental Demand on Total Sales and Profit

This table reports Intent-to-Treat and Treatment-on-the-Treated Effects of the random number of garments ordered total sales and firm profit two weeks after the experimental order was made. For the Treatment-on-the-Treated Effects the random assignment of order size is used as an instrument for order size accepted. Standard errors are clustered at the firm level. *** p<0.01, ** p<0.05, *p<0.1.

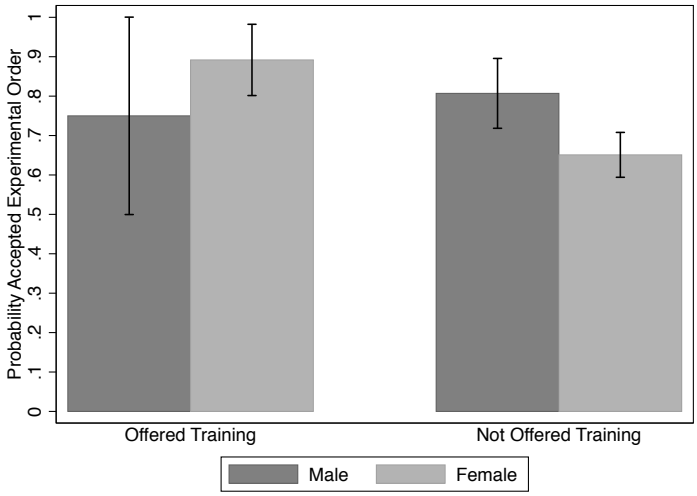
| | Total Sales | | Profits | |
|---|---|---|---|---|
| | Women | Men | Women | Men |
| Panel A: ITT | (1) | (2) | (3) | (4) |
| Order Size | 9.65** | -6.56 | 7.62* | -4.53 |
| | (4.59) | (7.20) | (4.41) | (6.46) |
| Constant | 121.31*** | 306.93*** | 91.48*** | 251.84*** |
| | (11.35) | (36.51) | (10.00) | (31.15) |
| Difference | -16.21* | | -12.15 | |
| (Men - Women) | 8.51 | | 7.79 | |
| Observations | 291 | 92 | 291 | 92 |
| Panel B: TOT | (1) | (2) | (3) | (4) |
| Order Size | 15.42** | -7.93 | 12.17* | -5.48 |
| | (6.66) | (8.74) | (6.62) | (7.77) |
| Constant | 121.19*** | 305.49*** | 91.39*** | 250.85*** |
| | (11.05) | (35.50) | (9.81) | (30.25) |
| Difference | -23.35** | | -17.65* | |
| (Men - Women) | 10.95 | | 10.18 | |
| Observations | 291 | 92 | 291 | 92 |

Figure A.1: **Compliance Figure**

This Figure depicts Order Acceptance (Sug-figure A) and reasons for Non-Acceptance (Sub-figure B) by Gender.




(a) Reason for Refusal




(b) Order Acceptance by Training Treatment Group

Table A.1: Attrition Balance

This table reports the balance in covariates between the sample that the firm census identified (full sample), and the firms that were in operation during the experiment (experimental sample). The mean is presented, with the standard error in parentheses. Standard errors are clustered at the firm level. *** p<0.01, ** p<0.05, *p<0.1.

| | Full Sample | Experimental Sample | Difference |
|---|---|---|---|
| Profits Last Month (GHS) | 138.01 | 141.31 | -3.30 |
| | (155.76) | (158.88) | (11.15) |
| Sales Last Month (GHS) | 196.72 | 202.82 | -6.11 |
| | (218.55) | (223.90) | (15.69) |
| Profits/Sales | 0.70 | 0.69 | 0.00 |
| | (0.13) | (0.13) | (0.01) |
| Firm Age | 9.49 | 9.54 | -0.05 |
| | (8.21) | (8.07) | (0.59) |
| Assets (GHS) | 1214.26 | 1232.66 | -18.40 |
| | (1668.16) | (1607.76) | (115.85) |
| Total Workers (excl owner) | 0.99 | 1.03 | -0.04 |
| | (1.63) | (1.67) | (0.12) |
| Hours Worked Last Week (owner) | 45.03 | 45.71 | -0.68 |
| | (18.18) | (18.13) | (1.29) |
| Profits per hour (GHS) | 0.74 | 0.75 | -0.01 |
| | (0.81) | (0.82) | (0.06) |
| Typical time to make garment (hours) | 2.34 | 2.31 | 0.03 |
| | (1.73) | (1.70) | (0.12) |
| Married or Living with a Partner (=1) | 0.71 | 0.72 | -0.01 |
| | (0.46) | (0.45) | (0.03) |
| Age | 35.53 | 35.42 | 0.11 |
| | (9.30) | (8.96) | (0.66) |
| Male (=1) | 0.23 | 0.24 | -0.01 |
| | (0.42) | (0.43) | (0.03) |
| Years of Schooling | 8.85 | 8.81 | 0.04 |
| | (2.30) | (2.29) | (0.17) |
| Ravens Score (out of 12) | 5.63 | 5.61 | 0.02 |
| | (2.64) | (2.62) | (0.19) |
| Firm is primary economic activity (=1) | 0.90 | 0.91 | -0.00 |
| | (0.30) | (0.29) | (0.02) |
| Has another business (=1) | 0.26 | 0.26 | -0.00 |
| | (0.44) | (0.44) | (0.03) |
| Farms for Income (=1) | 0.09 | 0.09 | -0.00 |
| | (0.29) | (0.29) | (0.02) |
| Caring for Children-Very Important | 0.38 | 0.38 | 0.00 |
| Reason Self Employment (=1) | (0.49) | (0.49) | (0.03) |
| Potential Future Growth-Very Important | 0.55 | 0.56 | -0.01 |
| Reason Self Employment (=1) | (0.50) | (0.50) | (0.04) |
| Average Garment Quality (out of 10) | 5.01 | 5.03 | -0.02 |
| | (1.23) | (1.23) | (0.09) |
| Experiment Order: Size | 2.13 | 2.23 | -0.10 |
| | (2.69) | (2.76) | (0.19) |
| F-Stat of Joint Significance | | | 0.03 |
| Probability F-Stat of Joint Significance | | | 1.00 |
| Observations | 417 | 383 | 417 |

Table A.2: Balance of Baseline Covariates for Women

This table reports covariate balance on baseline characteristics for women who received a positive demand shock and those that did not. The mean is presented, with the standard error in parentheses. Standard errors are clustered at the firm level. *** p<0.01, ** p<0.05, *p<0.1.

| | Positive Demand | No Demand | Difference |
|---|---|---|---|
| Profits Last Month (GHS) | 115.77 | 110.68 | 5.09 |
| | (118.36) | (125.13) | (16.76) |
| Sales Last Month (GHS) | 166.96 | 151.07 | 15.88 |
| | (168.46) | (164.12) | (22.36) |
| Profits/Sales | 0.69 | 0.70 | -0.01 |
| | (0.14) | (0.12) | (0.02) |
| Firm Age | 9.07 | 8.31 | 0.76 |
| | (7.76) | (7.86) | (1.09) |
| Assets (GHS) | 1102.18 | 1086.84 | 15.34 |
| | (1413.58) | (1826.14) | (236.31) |
| Total Workers (excl owner) | 1.03 | 1.03 | 0.00 |
| | (1.77) | (1.53) | (0.22) |
| Hours Worked Last Week (owner) | 42.22 | 41.01 | 1.21 |
| | (16.28) | (15.87) | (2.16) |
| Profits per hour (GHS) | 0.68 | 0.62 | 0.06 |
| | (0.71) | (0.61) | (0.09) |
| Typical time to make garment (hours) | 2.40 | 2.33 | 0.06 |
| | (1.56) | (1.45) | (0.21) |
| Married or Living with a Partner (=1) | 0.70 | 0.71 | -0.01 |
| | (0.46) | (0.46) | (0.06) |
| Age | 34.98 | 32.88 | 2.10 |
| | (8.63) | (8.67) | (1.21)* |
| Years of Schooling | 8.97 | 8.37 | 0.60 |
| | (2.24) | (2.63) | (0.36)* |
| Ravens Score (out of 12) | 5.62 | 5.58 | 0.04 |
| | (2.71) | (2.40) | (0.33) |
| Firm is primary economic activity (=1) | 0.90 | 0.87 | 0.03 |
| | (0.30) | (0.34) | (0.04) |
| Has another business (=1) | 0.31 | 0.30 | 0.01 |
| | (0.46) | (0.46) | (0.06) |
| Farms for Income (=1) | 0.02 | 0.10 | -0.09 |
| | (0.12) | (0.30) | (0.04)** |
| Caring for Children-Very Important | 0.40 | 0.49 | -0.09 |
| Reason Self Employment (=1) | (0.49) | (0.50) | (0.07) |
| Potential Future Growth-Very Important | 0.55 | 0.46 | 0.09 |
| Reason Self Employment (=1) | (0.50) | (0.50) | (0.07) |
| Average Garment Quality (out of 10) | 4.67 | 4.62 | 0.05 |
| | (1.04) | (1.19) | (0.18) |
| F-Stat of Joint Significance | | | 1.38 |
| Probability F-Stat of Joint Significance | | | 0.143 |
| Observations | 253 | 69 | 322 |

Table A.3: Balance of Baseline Covariates for Men

This table reports covariate balance on baseline characteristics for men who received a positive demand shock and those that did not. The mean is presented, with the standard error in parentheses. Standard errors are clustered at the firm level. *** p<0.01, ** p<0.05, *p<0.1.

| | Positive Demand | No Demand | Difference |
|---|---|---|---|
| Profits Last Month (GHS) | 209.33 | 245.00 | -35.67 |
| | (185.38) | (336.96) | (77.27) |
| Sales Last Month (GHS) | 301.96 | 334.50 | -32.54 |
| | (271.39) | (449.54) | (103.90) |
| Profits/Sales | 0.71 | 0.70 | 0.01 |
| | (0.13) | (0.09) | (0.03) |
| Firm Age | 11.42 | 11.58 | -0.16 |
| | (9.47) | (8.88) | (2.30) |
| Assets (GHS) | 1649.35 | 1440.15 | 209.20 |
| | (2294.49) | (978.97) | (342.42) |
| Total Workers (excl owner) | 0.85 | 0.84 | 0.01 |
| | (1.25) | (1.42) | (0.35) |
| Hours Worked Last Week (owner) | 58.91 | 42.25 | 16.66 |
| | (17.53) | (26.22) | (6.12)*** |
| Profits per hour (GHS) | 0.89 | 1.40 | -0.51 |
| | (0.76) | (1.95) | (0.49) |
| Typical time to make garment (hours) | 2.33 | 1.67 | 0.67 |
| | (2.45) | (0.85) | (0.34)* |
| Married or Living with a Partner (=1) | 0.75 | 0.65 | 0.10 |
| | (0.44) | (0.49) | (0.12) |
| Age | 39.17 | 37.74 | 1.43 |
| | (10.70) | (10.12) | (2.61) |
| Years of Schooling | 8.75 | 9.42 | -0.67 |
| | (2.37) | (1.12) | (0.38)* |
| Ravens Score (out of 12) | 5.72 | 5.55 | 0.17 |
| | (2.70) | (2.46) | (0.63) |
| Firm is primary economic activity (=1) | 0.92 | 1.00 | -0.08 |
| | (0.27) | (0.00) | (0.03)** |
| Has another business (=1) | 0.09 | 0.00 | 0.09 |
| | (0.29) | (0.00) | (0.03)*** |
| Farms for Income (=1) | 0.31 | 0.20 | 0.11 |
| | (0.46) | (0.41) | (0.11) |
| Caring for Children-Very Important | 0.21 | 0.30 | -0.09 |
| Reason Self Employment (=1) | (0.41) | (0.47) | (0.11) |
| Potential Future Growth-Very Important | 0.63 | 0.60 | 0.03 |
| Reason Self Employment (=1) | (0.49) | (0.50) | (0.12) |
| Average Garment Quality (out of 10) | 6.18 | 6.12 | 0.06 |
| | (1.07) | (0.88) | (0.25) |
| F-Stat of Joint Significance | | | 1.08 |
| Probability F-Stat of Joint Significance | | | 0.39 |
| Observations | 75 | 20 | 95 |