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Explaining Gender Differentials in Agricultural Production in Nigeria

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Abstract

This paper uses data from the General Household Survey Panel 2010/11 to analyze differences in agricultural productivity across male and female plot managers in Nigeria. The analysis utilizes the Oaxaca-Blinder decomposition method, which allows for decomposing the unconditional gender gap into (i) the portion caused by observable differences in the factors of production (endowment effect) and (ii) the unexplained portion caused by differences in returns to the same observed factors of production (structural effect). The analysis is conducted separately for the North and South regions, excluding the west of the country. The findings show that in the North, women produce 28 percent less than men after controlling for observed factors of production, while there are no significant gender differences in the South. In the decomposition results, the structural effect in the North is larger than the endowment at the mean. Although women in the North have access to less productive resources than men, the results indicate that even if given the same level of inputs, significant differences still emerge. However for the South, the decomposition results show that the endowment effect is more important than the structural effect. Access to resources explains most of the gender gap in the South and if women are given the same level of inputs as men, the gap will be minimal. The difference in the results for the North and South suggests that policy should vary by region.

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Explaining Gender Differentials in Agricultural Production in Nigeria

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1. Gender differences in agricultural productivity

Across Sub-Saharan Africa, a range of empirical studies have found that female farmers have lower yields than male farmers. A number of reports have documented this pattern and sought to explain it (SOFA, 2011, WDR 2012). Taken together, these studies suggest constraints in every step of the production process. First, women are likely to have less land to cultivate than men, and when they do, tenure security may be weaker. Second, their access to technology, information, and agricultural extension tends to be more limited compared to men. In growing crops, women are more prone to be constrained in their access to inputs, resulting in lower levels of fertilizer, labor, and other inputs than is optimal. Management of plots may reveal constraints as well – ranging from lower levels of education to trying to juggle dual roles as farm manager and household manager.

Although this is the general perception, the reality is more nuanced with some studies finding females to have lower average productivity than males while others find no significant differences between the two groups (see Croppenstedt et al., 2013). In many instances, back of the envelope calculations show that if you normalize inputs (taking into account access to land and productive inputs), the gender gap almost always disappears (WDR 2012). These findings indicate that women are not worse farmers, but just face certain constraints that limit their productivity. However, these types of calculations do not take into consideration that returns to productive inputs also matter. Men and women could have access to the same quantity of inputs, but with different returns.

Empirical issues complicate our understanding of the link between gender and agricultural productivity. A large proportion of the studies use the gender of the household head as the gender identifier while fewer studies have been able to examine the differences in productivity at the plot level. The latter approach allows researchers to match the characteristics of the individual in the household managing plot activities to the input use and productivity of the plot. Defaulting to the household head when plot level information is not available may mask some gender differences in productivity as it is possible for other members of the household to be responsible for the day-to-day decision making on the plot other than the household head. In a study of Ugandan households, Peterman et al. (2011) conducted a sensitivity analysis comparing plot level with household head level data and found that significant gender differences at the plot level disappear at the household head level. The authors speculate that this suggests gender differences in agricultural productivity may not be revealed at higher levels of aggregation that do not correspond to the basic decision making unit in specific farming systems. Kilic et al. (2013) is one of the few studies that have used nationally representative data to examine gender differences in agricultural productivity at the plot level. In their analysis on Malawi, they find that female managed plots are 25 percent less productive compared to male managed plots.

There is strong evidence to suggest that women have significantly less access to productive assets, such as land, credit, extension services, fertilizer, and agricultural machinery (WDR 2012). However, the evidence on the significance of this differential access in accounting for gender productivity gaps is mixed, and further research is needed to examine the extent to which the

differential quantity of inputs/outputs used/produced by female and male farmers (such as land) and gender differences in input prices may impact productivity gaps. Also, it seems likely that the choice of unit of analysis (gender of household head or gender of plot farmer/owner) has significant impact on study results, with plot level analysis appearing to capture more of the gender productivity gap.

In this paper, we examine gender-based productivity differences in Africa's most populous country, Nigeria. We bring to bear a nationally representative data set to examine first, if such a cross-gender productivity differential across plots exists in Nigeria, and second, to examine which factors in the production process seem to be driving it. Nigeria represents a particularly interesting case due to differences in the North and South regions of the country. The analysis is conducted separately for these regions based on the hypotheses that agro-ecological and socioeconomic conditions differ so substantially that gender differences are also likely to vary. To carry out this analysis, we utilize the Oaxaca-Blinder decomposition method which allows us to decompose the gender gap into (i) the portion due to observable differences in the factors of production (endowment effect) and (ii) the unexplained portion due to differences in returns to the same observed factors of production (structural effect). This method further allows us to identify the contribution of each of the factors of production to (i) and (ii).

The few studies on Nigerian gender differentials have focused on particular states or regions of the country and most have used household level data (Peterman et al., 2011; Timothy and Adeoti, 2006; Oladeebo and Fajuyigbe, 2007). Peterman et al. (2011) use data collected as part of an evaluation of the second phase of the World Bank sponsored National Fadama Development Project covering 12 Fadama states in northern Nigeria. Using household level data, the authors find persistent lower productivity among female headed households, even when accounting for a range of socio-economic variables, agricultural inputs and crop choices (Peterman et al., 2011). They also found that the results vary across crops as well as by agro-ecological zone in Nigeria and inclusion of biophysical characteristics, suggesting either cultural or regional gender differences or crop-specific comparative advantages that interact with productivity and gender. Timothy and Adeoti (2006) use a Cobb-Douglas production function to analyze data on cassava farmers in Ondo and Ogun states in Nigeria and their results suggest that while female farmers are more economically efficient than male farmers, male farmers have higher average technical and allocative efficiency than female farmers. While the study by Oladeebo and Fajuyigbe (2007) conducts its gender analysis at the plot level, the study was carried out exclusively on data for the tropics in Osun State, South-western Nigeria. The authors found that women farmers are more efficient technically than men farmers with mean technical efficient indices of 0.904 and 0.897 respectively, but the difference is not significant.

In this study, we find that women in the North produce 28 percent less than men after controlling for observed manager characteristics and factors of production—a result that is very similar to the Peterman et al (2011) who find a 32 percent difference. In our decomposition results, we find that the unexplained portion of the gender gap in the North is bigger than the explained portion at the mean. Although women in the North have access to less productive resources than men, the results indicate that even if provided with the same level of inputs, significant differences may

still emerge. Of course women in the North will definitely benefit from additional inputs, like fertilizer and labor, if their land size were to remain the same.

In the South, even though we find an unconditional gap of 24 percent between the productivity of male and female plot managers, this disappears once we control for observed factors of production and becomes statistically insignificant. This result mirrors the lack of statistically significant differences found by Oladeebo and Fajuyigbe (2007) in South-western Nigeria. When we decompose differences, in the South we find that the endowment effect is more important than the structural effect. Access to resources explains most of the unconditional gender gap in the South, and if women are given the same level of inputs as men, the gap diminishes. In general, while men may use more fertilizer and labor on their agricultural plots than women, they do not seem to be using enough proportional to their land size. Women could do with more inputs like fertilizer and labor and if not for the large diseconomies of scale in land size, the gap between men and women would be much wider.

The remainder of the paper is organized as follows. Section 2 briefly notes the context and data used in the analysis, providing descriptive statistics for the North and South. Section 3 provides an assessment of gender differentials following common approaches to discerning the source of male and female productivity differences. Section 4 provides insight into the relative importance of different factors in explaining gender differences using a Oaxaca-Blinder decomposition. These differences are explored more fully in Section 5 using a re-centered influence function (RIF) which examines this differential across the distribution. Robustness checks of the results are presented in Section 6 and conclusions in section 7.

2. Context and data

According to the Nigeria National Bureau of Statistics (NBS), agriculture employs about 60 percent of working population and contributes about 40 percent to GDP. With a population of almost 160 million people, Nigeria has 91.1 million hectares of land with agriculture taking up 83.6 million hectares of which 33.8 percent is arable land, 2.9 percent is permanent crops, 13 percent is forest or woods, 47.9 percent is pasture, and 2.4 percent is irrigated (Phillip et al., 2009). Nigerian agriculture is characterized by small scale farmers, who mostly practice subsistence farming with little commercialization, producing common food crops such as millet, maize, sorghum, cassava, yams, and beans.

Nigeria is divided into six geopolitical zones[1], three in the North (North east, North west and North central) and three in the South (South east, South west and South south). Agriculture is more common in the north with over 80 percent of households engaged in the sector compared with about 50 percent of households in the south. Although Nigeria has recorded increasing agricultural growth in the past decade, much of the growth has been attributed to the farming of larger tracts of land by commercial farmers rather than increased productivity among small farms.

[1] State distribution within the zones**:** South West - Oyo, Osun, Ogun, Lagos, Ekiti, Ondo; South-South - Cross-River, Akwa- Ibom, Rivers, Bayelsa, Edo, Delta; South East - Enugu, Anambra, Ebonyi, Abia, Imo; North Central - Plateau, Kwara, Niger, Kogi, Benue, Nasarawa, FCT Abuja; North East - Borno, Yobe, Bauchi, Gombe, Taraba, Adamawa; North West - Jigawa, Katsina, Kano,Kaduna, Kebbi, Sokoto, Zamfara

According to the latest poverty reports, 46 percent of the country can be classified as poor and the poverty incidence is highest in the agricultural sector (Phillip et al, 2009).

Like many other countries in Africa, women in Nigeria have broadened and deepened their involvement in agricultural production in recent decades (WDR, 2008). Although men dominate the sector in Nigeria, a large share of women also participates across the agriculture value chain; as they are involved in production, processing, and sales. Overall, 48 percent of female headed households participate in the agriculture sector and, in the rural areas; almost 70 percent of female headed households are involved in the sector[2]. While there is debate in the general literature on gender and agricultural productivity as to the contribution of the differential use of inputs in explaining productivity gaps, it is certainly true across a range of countries that women tend to have lower levels of usage of various productive assets (see for example Croppenstedt et. al. 2013). This is also true in the case of Nigeria. Despite their significant role in agricultural production, earlier work on Nigeria has shown that women have relatively limited access to agriculture land and lower levels of inputs and use of extension services compared with men (Phillip et al., 2009).

Taken together, these constraints could limit women's productivity relative to men. For instance, lower access to credit is thought to impact women's ability to engage in more productive irrigation farming, as this requires more expensive equipment and labor (Porter and Philips-Howard, 1997). In addition, women's lower levels of agency and decision-making power may negatively impact their ability to benefit from their activities in the agriculture sector, as well as in other areas of their lives.[3]

To assess these gender differences, this paper uses data from the General Household Survey-Panel (GHS-Panel) conducted in 2010/11 by the Nigeria National Bureau of Statistics (NBS) in collaboration with the World Bank Living Standard Measurement Study (LSMS) team. The GHS-Panel survey is modeled after common LSMS surveys and is representative at the national, zonal and rural/urban levels. The total sample is made up of about 5,000 households, out of which about 3,000 are agricultural households, covering all thirty-six states in the country and the Federal Capital Territory, Abuja.

One of the main objectives of the GHS-Panel is to improve agriculture data collection in Nigeria by collecting information at disaggregated levels, including at the crop, plot, and household levels. Households were visited at two points in time; right after planting (post-planting visit) and right after harvest (post-harvest visit). During the visits, information was gathered on the household demographic structure, education, labor, assets, and farm and nonfarm income generating activities. One of the advantages of the agriculture modules in the survey is that they allow us to identify the manager of each individual plot farmed by the household. When combined with the demographic and other types of information in the household modules, we are able to determine the gender and socio-economic characteristics of each manager instead of

[2] These figures are from the GHS-Panel survey 2010/11 implemented by the NBS

[3] See Ani (2003) and Damisa and Yohanna (2007) for analysis on effect of decision making on agricultural activity in Nigeria.

simply using the household head as the default plot's manager. Handheld Global Positioning System (GPS) devices were used to collect information on plot sizes and the location of households, which allows not only a more accurate measure of land size but an ability to link the data with geospatial variables from other data sources.

The analysis in the paper focuses on 2,431[4] agricultural households farming 4,240 plots with GPS plot measurement over 100 square meters and information on plot manager's age and education level. Of the 4,240 plots, 15 percent were managed by females.[5] It is also common for plot managers to manage multiple plots, with 65.7 percent of managers managing more than 1 plot. Not unexpectedly, this is more common for male managers.[6] Table 1 shows the distribution of the plot manager's gender by the six geopolitical zones in the country. As seen from the table, there are more female managers in the Southern zones compared to the Northern zones. The South East zone has the highest proportion of female managers and the North West zone has the lowest proportion.

Given the few female managed plots in the North West and South West in our sample, our analysis excludes the West of the country. We also exclude Niger and Abuja states because there are no female managed plots in our sample in these two states, reducing our sample size to 2,995 plots. In addition, our preliminary analysis shows significant differences between the North and South of the country, reflecting the general socioeconomic and agro-ecological differences across the two regions. For these reasons, we analyze the North and the South separately given the expectation that they differ.

Although agriculture production information was collected at the crop level, the crop harvest values are aggregated to the plot level in order to estimate production for each plot. Productivity is measured as the monetary (Naira) value of all crops grown on the plot under the manager's purview.[7] Table 2 presents the average productivity for male and female managers in Nigeria and separately for the North and South regions. Tables 3 and 4 provide the summary statistics of the value of plot harvest per hectare, the relevant explanatory variables, and the results of the test of mean difference between the male and female managers for the included North and South regions, respectively.

North Central and North East

Looking at the North Central and North East regions (Table 3), the value of harvest on male managed plots is higher (₦134,689) and significantly different from the value of harvest on

[4] We limited the sample to households that were present in both the post planting and post-harvest visit of the GHS-Panel 2010/11 (There are about 4-5 months between visits). Furthermore, we focused on the agricultural households for which complete information of GPS plot measurement and production estimates are available. We dropped plots of less than 0.1 hectares and all plots in Enugu state due to issues with the GPS land measurement in that state.

[5] For almost all the male managed plots (98.7%), the manager is also identified as the head of the households. However, for female managed plots, only for 52.1 percent of plots are also the head of the households.

[6] 67.8 percent of male managers claim at least 2 plots compared with 52.9 percent of female managers.

[7] The Naira value of harvest on each plot was calculated by multiplying the quantity of harvest in kilograms of each crop on the plot by the median sales value of the crop in each local government area (LGA) and aggregating to the plot level. In cases where we don't have enough observations in the LGA, we use the value at the next geographical level, zone, state and country as needed. For our main dependent variable, value of harvest per hectare, we divide the value of harvest by the GPS reported plot size.

female managed plots (₦50,629). However, when we control for plot size by putting the value per hectare, the difference is not as wide (but still statistically significant at the 10 percent level) with average male value of harvest per hectare at (₦454,075) compared with female managed plots at (₦293,688). This can be viewed as the unadjusted gender gap observed in the North where productivity of female managed plots is 35 percent lower than that of male managed plots. This difference is what we would like to explain in the subsequent analysis.

Differences in productivity may be due to differences in characteristics of male and female managers and in Table 3, we observe statistically significant differences between managers in a host of socio-demographic characteristics. Female managers are more likely to be non-Muslim, have less years of schooling, more likely to live in households with a smaller adult labor pool (ages 12-60) and also have fewer child dependents. Differences can also be observed in plot sizes with female managed plots 42 percent smaller on average than male managed plots. The average plot size of female managed plots is 0.5 hectares, while that of male managed plots is 0.9 hectares.

Another reason for differences in productivity may be in the use of inputs. In terms of non-labor inputs, male managers are more likely than female plot managers to employ the use of fertilizer, herbicide and pesticide on the plots they manage. The incidence of fertilizer use is 40 percent for male managed plots compared to 19 percent for female managed plots. The quantities of fertilizer used on male managed plots are also larger than those on female managed plots. However when we normalize by plot size, the difference is no longer statistically significant. The log value of agriculture capital per hectare[8] owned by households of male managers is 15 percent higher than the value of the capital owned by households of female managers but the difference is not significant. Given these factors, it is surprising to find that, female managed plots are more likely to grow cash crops[9] than male managed plots with 17 percent of plots managed by females growing at least one cash crop compared to 13 percent of male managed plots, but the difference is not significant.

Labor inputs are categorized into family (men, women, and children) and hired labor (men, women, and children). Male managed plots are more likely to use male family labor (85 percent) than female managed plots (48 percent). They also get more days of male labor on average, but this difference is not significant once we control for plot size. On the other hand, female managed plots are more likely to use female family labor (73 percent) compared with male managed plots with 52 percent. Female managed plots also get more days of female family labor than male managed plots, even when controlling for plot size. In terms of labor from outside of the household, female plot managers are more likely to use male hired labor. Once we normalize for

[8] Agriculture capital is measured as the monetary value of all agriculture assets owned by the household of the manager. The agriculture assets include tractor, plough, trailer/cart, ridger, planter, pickup truck, harvester, water pump, sprinkler, sprayer, outboard motor, canoe, boat, fishing net, wheel barrow, cutlass, hoe, and others. It should be noted that agriculture capital is collected at the household level and plot managers from the same households will have the same value for agriculture capital. There are 77 households in the sample that have both male (with 127 plots) and female plot managers (with 91 plots).

[9] Cash crops include groundnut, cotton, cocoa, rubber, cotton and oil palm.

plot size, however, male plot managers use more male hired labor than female plot managers, but the difference is not significant.

South East and South South

Although for the South East and South South regions we also observe differences in value of harvest per hectare favoring male managed plots (Table 4), the difference is not statistically significant. However, we still want to understand the factors influencing where differences do occur and again provide descriptive statistics of the characteristics of managers and input use.

In the two southern regions, female plot managers are more likely to be non-Muslim and have less years of schooling compared with male managers. Male managers are more likely to be from households with larger family sizes and have significantly more household adult male and female labor pool.

Unlike the North sample, significant differences in the land size managed by male and female plot managers are not found. On average, male managers are from households who used extension services and have higher value of agricultural capital. While we do find that men are more likely to use herbicide, we find no differences in fertilizer, herbicide or pesticide use per hectare between male and female managed plots. However, we do find significant differences in the use of labor. Male managed plots are more likely to use male family labor and have significantly more days of male family labor compared with female managed plots. Although, female managed plots are more likely to use female family labor, there is no statistically significant difference between days of female family labor used on plots between the two groups. For hired labor, male managed plots are more likely to use hired male labor and have significantly more days of hired male and female labor. However, once we normalize for plot size, these differences in days of hired labor are no longer statistically significant.

3. Assessing gender differentials

The traditional method for examining differences in agriculture productivity between men and women is by estimating a yield function that models the value of output per hectare as a function of a set of factors that influence production as well as an indicator of the gender of the plot manager (Quisumbing, 1996). The motivation for taking this approach is to determine if any differences between male and female managed plots can be explained through factors other than gender (although they may, in turn, be driven by gender relations). A common approach in the literature is to use the gender of the head as the gender indicator, but with the GHS-Panel data we are able to identify the gender of each plot manager within a household. This allows the use of the manager's gender rather than that of the household head who may not be the primary decision maker on the plot. We examine the yield function for plot *i* under the management of plot manager *j*:

$$y_{ij} = \alpha + \gamma g_j + \sum_{h=1}^{H} \pi_h c_{jh} + \sum_{k=1}^{K} \varphi_k l_{ijk} + \sum_{q=1}^{Q} \omega_q s_{ijq} + \sum_{r=1}^{R} \rho_r x_{ijr} + \sum_{t=1}^{T} \theta_t z_{ijt} + e_{ij} \quad (1)$$

Where y is the natural logarithm of plot i's harvest value per hectare obtained by manager j, α is the unknown constant term to be estimated, g is the manager's gender (gender dummy), c is the set of H individual characteristics of manager j, l is the set of the K plot characteristics, s is the set of Q cropping strategies, x is the set of R inputs utilized on the plot, z is the set of T different labor types used on the plot, and e is the random error term assumed to be independently and identically distributed as $N(0, \sigma^2)$.

The gender of the plot's manager is the variable of interest. In our initial multivariate examination, we use a progressive approach (including additional control variables to the model in each step) to try and explain the gender difference in productivity. The logic of this approach is to identify if and how each set of factors influences the conditional gender differential. The initial step (step zero), which we refer to as the naïve regression, only considers the manager's gender as the sole covariate regressed against the value of the plot's harvest with no location fixed effects. The first step includes state fixed effects to control for location differences. The second step includes the manager's characteristics, such as age, education level, household aged labor, and participation in non-farm activities. The third step includes the plot size and plot characteristics. The fourth step includes the cropping strategies adopted by the manager (cash crop grown on the plot and number of crops grown on the plot). The fifth step adds the quantity of inputs into the model. Finally, family and hired labor are added to the model in the final step.

Following the previously reported evidence suggesting regional variation in the gender productivity relationship, the model is estimated for the North and South regions separately. The results are displayed in the same order as described in the preceding paragraph for the North and South in Tables 5 and 6, respectively. The first seven columns display the step-wise results of the pooled sample. For comparison, and as a reference for the subsequent analysis, columns 7 and 8 show the results for male and female managed plots separately.

North Central and North East

In column zero of Table 5, the result of the naïve regression estimating the effect of the manager's gender on productivity show no statistically significant difference in productivity between male and female managed plots. The inclusion of the state fixed effects (column 1) or of the manager's attributes (column 2) also indicate no statistically significant differences between the two groups. Statistically significant differences in productivity emerge in column 3 after plots' sizes are included. The effect of land size and land size squared are both negative and strongly significant, indicating that productivity declines with land size. This follows the common inverse relationship between land size and productivity observed in other studies (e.g. Carletto et al., 2013). As can be seen in Figure 1a and in the mean land values in Table 3, female managed plots are smaller than those managed by men. Once we control for land size, we see a difference in productivity indicating that gender differences observed in the North are masked in our initial regressions because women manage smaller size plots.

Although this conditional gender gap observed after controlling for land reduces in size when we add other key factors of production such as labor, capital and other inputs (columns 4-6), the gap still persists. In column 6, we observe a conditional estimated gender gap of 27.4 percent for the

North. We find that the number of adults in the household (both male and female) have positive effects on productivity. As expected, the quantity of fertilizer used and the value of agriculture capital owned by the household also have positive associations with productivity. Amongst the labor inputs, days of hired male labor is positively related to agricultural productivity. Interestingly, we find that growing only one crop on a plot (as opposed to multi cropping system) is associated with significantly lower productivity.[10]

In columns 7 and 8 we display the results of the female managed plot sample and male managed plot sample respectively. Overall the results of the individual regressions point to fundamental differences in the factors that influence productivity on male and female plots in these two regions of northern Nigeria. Age appears to have a positive and significant effect on productivity on female managed plots, but the effect becomes negative for older women. However, the age of the manager does not appear to be important for yields on male managed plots. Being a non-Muslim female manager has a sizeable and negative effect on productivity on female plots but the effect is not significant for male managed plots[11]. The number of adults in the household is found to have a positive and significant effect on male agricultural productivity but is not statistically significant for females. Growing a cash crop has a positive and significant coefficient for female managed plots but it is not significant for males while growing only one crop on the plot has a negative effect for the male sample but is not significant for females. Although the quantity of fertilizer used is positive for both male and female managed plots, fertilizer is not significantly related to productivity on female managed plots. The use of purchased seed has a significant negative effect on male agricultural productivity but is not significant for female managed plots. While the effect of agriculture capital and days of hired male labor is positive and significant for both male and female managed plots, the returns to both covariates is higher for female managed plots.

South East and South South

The analysis of gender differences in the South present a different picture than the North. First, the results of the naïve regression for the South (Table 6, column zero) show that male managed plots have higher productivity than female managed plots and the gender coefficient is statistically significant at the 10 percent level. Yet, the results are not statistically significant in any of the other specifications. The inclusion of state fixed effects (column 1) reduces the magnitude of the gender difference and makes it insignificant suggesting gender differences are a remnant of regional variation in productivity. The inclusion of additional variables in this case does not unmask underlying gender differences.

Column 6 shows the full model with all the key factors of production. The number of adult females in the household has a negative effect on productivity but we find a positive effect for adult males in the household. As expected, log of land size in hectares has a negative effect on productivity showing the same diseconomies of scale observed in the North sample. As with the

[10] Use of purchased seeds also has a negative and significant effect on productivity. It should be noted that using purchase seeds is not an indication of using improved seeds. The only meaning to be assigned to it is that at least some of the seeds used on the plot were purchased rather than received free of charge or from leftovers.
[11] We discuss below why this may be related to geographical features rather than religion per se.

Northern sample, growing only one crop on the plot is associated with significantly lower productivity. The coefficients of log of quantity of fertilizer and herbicide used per hectare are positive and have a statistically significant relationship with productivity. However, the log of pesticide per hectare has a negative association with productivity. We also find that the log of agricultural capital per hectare has positive relationship with productivity. The only labor input with a statistically significant effect for the pooled southern sample is log of male family labor days per hectare which has a positive relationship with productivity.

Columns 7 and 8 of Table 6 show the results for female only and male only sample in the South, respectively. As with the results for the northern regions of Nigeria, in the South we do find fundamental differences in relationships on male and female plots. The number of adult males in the household has a positive effect on productivity but only for the male sample. For the female managed plot sample, we find that plot distance to the household has a positive effect on productivity. This is probably because plots farther from the household are more likely to be bigger compared to those closer to dwellings. Log of fertilizer and herbicide use per hectare are positive and statistically significant for both male and female managed plots but the effect is larger for male managed plots. The coefficient of log of pesticide use per hectare has a negative effect for male managed sample but it is not significant for the female managed sample. In terms of labor inputs, we find the log of male family days per hectare and hired male labor per hectare to be positive and statistically significant for male managed plots but no labor input was significant for the female managed sample. Although these differences emerge, in contrast to the North, in this case, the differences do not appear to translate into significant overall gender differences in productivity.

4. Decomposing gender differentials

The previous analysis helps to identify the factors that explain the difference between productivity on male and female managed plots, but does not isolate the relative importance of the different factors. To gain insights into the importance of these factors, we follow Kilic et al. (2013) and decompose the yield gap using the Oaxaca-Blinder decomposition method [12] as described in Blinder (1973) and Oaxaca (1973). This model allows for the quantification of the contributions of the explanatory variables to the productivity differential for male and female managed plots. In the absence of an advantage to any particular group, the expected values for the coefficients for each group must be the same. Therefore, the only source for observed yield differences between groups should be based on differences in inputs or characteristics.

If the covariates from our aforementioned production function (equation (1)) are taken as a single $(N^{13} \times 1)$ vector X^{14} that encompasses the above mentioned explanatory variables except for the plot manager's gender, the expected harvest value per hectare on a plot for a manager of either gender $(g = m, f)$ is:

$$E(y_g) = \alpha_g + E(X_g)'\beta_g \quad (2)$$

[12] See Kilic et al. 2013 for a detailed discussion on the assumptions of the Oaxaca decomposition methodology.

[13] $N = H + K + Q + R + T$

[14] $c, l, s, x, z \subseteq X$

Where g is used as a subscript to designate male (m) or female (f) plot manager. The intercept term is α and β[15] is a $(N \times 1)$ vector of the slope parameters (coefficients) corresponding to each explanatory variable. Note that the above equation assumes that $E(e_g) = 0$. The mean outcome difference between male and female plot managers may now be expressed as the difference between the expected plot harvest values for each gender. The difference (i.e. gender gap) is:

$$Gap = E(y_m) - E(y_f) = \alpha_m + E(X_m)'\beta_m - \alpha_f - E(X_f)'\beta_f \ (3)$$

Oaxaca (2007) comments on the importance of determining the source of the gap which comes from differences in the characteristics (i.e. explanatory variables) and the amount attributable to the parameter gap. Obtaining the "two fold" difference requires including in the above equation the nondiscriminatory coefficients, as noted by Jann (2008). The nondiscriminatory coefficients are those obtained from the pooled (i.e. combined) expected plot harvest value, which also includes the gender dummy (g). The gender dummy incorporates the possibility of each gender's plot harvest value lying on a different curve (Jann, 2008). The pooled expected plot harvest value (y_{ij}) is then:

$$E(y_{ij}) = E(y) = \alpha + \gamma g + E(X)'\beta^* \ (4)$$

where β^* is the vector of nondiscriminatory coefficients. This is the methodology preferred by Jann (2008) for obtaining the nondiscriminatory coefficients. Fortin (2006) comments that this is compatible with the practice of including a dummy variable denoting the group of interest in a pooled regression, in order to investigate the difference between groups as in equation (1). By including this result into the gap equation it is possible to obtain the "two-fold" decomposition:

$$Gap = Q + U \ (5)$$

Where Q is referred to the part "explained" by the group differences in the explanatory variables (Jann, 2008). Fortin et al. (2011) refer to this as the composition effect and is equal to:

$$Q = \left[E(X_m)' - E(X_f)'\right]\beta^* \ (6)$$

According to Jann (2008) the remaining part (U) is the "unexplained" part and this is attributed to discrimination (or differences in returns). The reason for referring to it as "unexplained" is due to there being a possibility of omitted variables and thus bias in the estimates (Oaxaca, 2007). Fortin et al. (2011) also refer to this portion (U) as the structure effect, which is equal to:

$$U = (\alpha_m - \alpha) + [E(X_m)'(\beta_m - \beta^*)] + (\alpha - \alpha_f) + \left[E(X_f)'(\beta^* - \beta_f)\right] \ (7)$$

This equation can be subdivided into two distinct parts. One part quantifies the discrimination in favor of one group (or the structural advantage), in this case males:

[15] $\pi, \varphi, \omega, \rho, \theta \subseteq \beta$

$$U_m = (\alpha_m - \alpha) + [E(X_m)'(\beta_m - \beta^*)] \ (7a)$$

The other part, which quantifies the discrimination against (or the structural disadvantage) the other group, in this case females:

$$U_f = (\alpha - \alpha_f) + \left[E(X_f)'(\beta^* - \beta_f)\right] \ (7b)$$

This method then discerns the portion of the gap which may be due to differences in inputs or characteristics, and the differences due to the structural effect. The structural effect permits the disaggregation of a possible advantage for males and a possible disadvantage for females. Thus, the method estimates a yield structure which is not obligatorily identical to that of either group (Oaxaca, 2007).

As with the previous analysis, the decomposition model is estimated for the North and South regions separately. The results are displayed in Tables 7 and 8, respectively, with results shown for the mean gender differential, the aggregate decomposition and the detailed decomposition.

North Central and North East

Given the change from a small insignificant gender gap in the unconditional (naïve) regression to a conditional gap of 27.4 percent when we control for the key factors of production, understanding the factors that are associated with this gap is important. Although the decomposition results do not offer a causal effect of the covariates on productivity, it allows us to delve deeper into how different factors contribute to the gender gap.

The estimates in Table 7 are a function of the mean differences reported in Table 3 by the gender of plot manager and the pooled regression coefficients reported in column 6 of Table 5. The observed mean gender gap (same as the naïve regression result) of about 4 percent (in favor of male managed plots) is not significant. However, aggregate decomposition components; the portion of the gap due to the differences in average characteristics from Table 3 (endowment effect as shown in equation 6) and the portion due to differences in returns shown in columns 7 and 8 of Table 6 (unexplained factors as shown in equation 7) are both significant. So for the North, in the decomposition result we find the explained portion is -24 percentage points (statistically significant) due to difference in endowments and unexplained portion is 27.4 percentage points (statistically significant). Gender disparities in the North are driven more by the unexplained factors than by the observed characteristics. The unexplained portion is further disaggregated into the male structural advantage (equation 7a) and female structural disadvantage (equation 7b).

To understand the factors that contribute the most to the different components of the gap, we start with the endowment effect which as mentioned previously is the portion of the gap that is due to differences in levels of observed variables of male and female managed plots. In the disaggregated panel (Table 7, Panel C), we can identify the variables that contribute the most to the endowment effect. A positive coefficient widens the gender gap while a negative coefficient reduces the gender gap.

In the summary statistics table (Table 3), we observed that men tend to live in households with a larger household adult labor pool, have higher incidence of fertilizer use, and are more likely to use hired labor than female managers. Not surprisingly, we find that these factors contribute positively to the endowment effect and thus widen the gender gap. Since women have smaller plot sizes (Table 3) and we find an inverse relationship between land and productivity (Table 5), this contributes negatively to the endowment effect and thus reduces the gap. In fact, land is the factor that contributes the most to the endowment effect. Overall, this reinforces the earlier observation that the gender difference is masked in an overall analysis because women manage much smaller plot sizes, which generally have higher productivity.

Moving on to the unexplained portion of the gap which shows the return to each factor of production, we find that overall, the returns to factors of productivity is lower for women. Older women seem to face a substantial disadvantage. Similar effects are found for older males, but the effects are not as large. While female managers tend to be older, there is no immediate explanation for the source of this disadvantage. However, it is worth noting that female managers are more likely to be widowed and hence older. Since we are controlling for inputs, we can rule out any direct contribution from inputs such as the quantity of land, command over labor, and other inputs. Thus, whatever is driving this disadvantage must stem from some more indirect source. This finding could benefit from further research. Being a non-Muslim female manager in the North also shows a positive contribution to the structural disadvantage, thus widening the gap. Further examination (not shown here) shows that this is possibly capturing location-specific effects since many of the non-Muslim female managers in the North reside in enumeration areas where few Muslims reside.

Participation in a nonfarm activity has a negative coefficient for female structural disadvantage. In Table 3, we did not find a significant difference in nonfarm participation for male and female managers but it appears that the return to participation in these activities generates a higher return in agriculture for women than it does for men, thus working towards reducing the gap. Looking at the number of adult females in the household, women appear to have a lower return to more adult females in the households than men, and this widens the gap. Women have higher returns from growing cash crop, planting multiple crops on their plots, and using purchased seeds than men, thus working towards reducing the gender gap. Given these results, an expansion of commercial agriculture, including cash crops, would have a positive overall impact on women’s production and, all else equal, would help to close the production gap.

In summary, women in the North lack an adequate adult labor pool, could do with more fertilizer, and more hired labor. Given the large diseconomies of scale observed, if women in the North farmed the same plots size as men, the gap would be bigger, all else equal.

South East and South South

Table 8 presents the decomposition results for the South on the differential in log of value of output per hectare between male and female managers. The estimates are a function of the mean differences reported in Table 4 and the pooled regression coefficients in column 6 of Table 6. Although once we control for factors of production, we do not observe a statistically significant

difference in productivity of male and female managed plots in the South, it is still important to decompose the unconditional gender gap of 24 percent (statistically significant at the 10 percent level) to understand the factors that contribute to the gap. The aggregate endowment effect is significant but the portion of the gap due to unexplained factors is not significant. The gender differences in South are largely driven by endowments effects unlike our findings in the North that were more driven by the structural effect.

Looking at the disaggregated decomposition of the endowment effect, we find that household adult female size contributes negatively to the endowment effect, thereby reducing the gap. In Table 4 we found that male managed plots in the South are bigger than plots managed by female managers but the difference was not statistically significant. However, as in the North, land contributes negatively to the endowments effect and has the most sizable effect of all the covariates. The log of herbicide use per hectare widens the gap and contributes positively to the endowment effect. In the summary statistics of Table 4, male managed plots do have more access to these factors than female managed plots. We also observe strong location effects contributing positively to the endowment effect in the South, thereby widening the gap (this comes from the state fixed results which are not displayed in the table due to space constraints).

In the structural effects disaggregated results, we find that age squared has a sizable positive and significant contribution to the female structural disadvantage, thus widening the gap. Further examination suggests this may be capturing the effect of being a widow. As in the North, most of the female managers in the South are widowed and the widows are more likely to be older. The child dependency ratio contributes positively to male structural advantage and widens the gap – that is, males seem to get a higher return from having more children relative to adults than women do. We also find that schooling contributes negatively to the male structural advantage. While the summary statistics indicate that men have higher levels of education than female plot managers in the South, this result indicates that that schooling is giving them a lower return relative to women.

In summary, even though having more female adults in the households reduces the gap, we find that having more days of female family labor widens the gap. Women in the South could also do with more herbicide. Moreover, older women in the South appear to be at a disadvantage. On the other hand, males with higher education are relatively disadvantaged, while those with more children in their household are at more of an advantage.

5. Re-centered influence function (RIF) decomposition

The Oaxaca decomposition detailed above provides results for the average plot manager, and thus provides a mean outcome difference between male and female managers. While having this provides an average relationship, we would like to observe how the relationship differs across the distribution. A regression method proposed by Firpo, Fortin and Lemieux (2006) permits evaluation of the relationship across the distribution in a manner that is similar to a standard regression except that the dependent variable is replaced by the re-centered influence function of the statistic of interest. This model can be used to infer the impact of the independent variables on a specific statistic. The re-centered influence function (RIF) is defined as:

$$RIF(y;v) = v(F_y) + IF(y:v)$$

Where y is the dependent variable to be replaced by the estimated *RIF(y;v)*, here y can be replaced by either $y_{ij}, y_m, or\ y_f$ depending on our need[16], $v(F_y)$ is the distributional statistic of interest, in this case quantiles. The last term to the right ($IF(y:v)$), is the influence function corresponding to an observed value of *y* for the distributional statistic $v(F_y)$ and is equal to:

$$IF(y;v) = \frac{\tau - \mathbf{1}\{y \leq v(F_y)\}}{f_y(v(F_y))}$$

Where τ is the τ^{th} quantile of $v(F_y)$, $f_y(v(F_y))$ is the density of the marginal distribution of the dependent variable (*y*), and $\mathbf{1}\{y \leq v(F_y)\}$ is an indicator function equal to 1 if the term inside the brackets is satisfied and 0 if not.

Firpo et al. (2006) lay out the methodology in order to compute the RIF and proceed to run the regressions detailed above replacing the dependent variable with the RIF values. Initially the RIF must be estimated separately for each gender. The RIF is calculated using the calculated sample quantile and the estimated density at the point utilizing kernel density methods. Once the estimated RIF is obtained, it is used as the dependent variable in the Oaxaca decomposition detailed above.

North Central and North East

Table 9 presents the RIF results for the North and includes the results of the mean decomposition from Table 7 for comparison. We find significant results across many of the deciles for the endowment and female structural advantage components just as in the mean decomposition. In general, the endowment effect increases across the agricultural productivity distribution. The effect is not significant for the lower part of the distribution, becomes significant with estimated values in the range of -0.18 to -0.24 for the 30th to 70th percentile and then increases even more in the highest two deciles (-0.30 and -0.42). The share attributable to the female structural disadvantage varies in significance. In the middle of the distribution (40th to 60th percentile), it is significant and in the range of 0.21 to 0.34 and again is large and significant at the highest percentile of the distribution. At the 50th percentile (median), the share of the gap attributable to female structural disadvantage exceeds that of the endowment effect. However, for the highest decile, the endowment effect exceeds the female structural disadvantage component of the gender gap. This suggests that among the more productive women in the North, resources (rather than the return to resources) matters more.

Table 10 presents the detailed RIF decomposition results for only the 10th, 50th, and 90th percentiles to conserve space. One key finding in the endowment effect for the North is that women's land sizes are so much smaller than men's that the negative contribution of log of land

[16] When estimating the RIF decomposition, the same procedure as in the Oaxaca decomposition is followed, except that in the estimations of the different dependent variables of the decomposition we substitute the relevant dependent variable with the RIF for the same variable.

in hectares to the endowment effect overshadows the positive contributions of other factors, thus significantly diminishing the gap between male and female managed plots. Similar to the findings in the mean decomposition, log of fertilizer use per hectare contributes positively to the endowment effect thus widening the gap and is statistically significant for all deciles except for the highest decile. In addition, male hired labor contributes positively to the endowment effect all across the distribution while male adult labor pool in the household contributes significantly to the endowment effect at the 10^{th}, 40^{th} (not shown), and 90^{th} percentile. These findings are similar to what we find at the mean indicating that fertilizer and male labor are the main factors that favor male productivity and if not for the large diseconomies of scale in land size, the gap between men and women will be much wider.

Looking at the female structural disadvantage, the effect of age squared found at the mean is also found at the lowest deciles but from the median and higher, it is no longer significant indicating that at the higher productivity deciles, older women face less of a disadvantage compared to the lower deciles. The non-Muslim effect observed at the mean decomposition is not significant for any individual decile. At the top two deciles, the household female adult pool contributes positively to the male structural advantage and female structural disadvantage, thus widening the gap. Interestingly, from the median upwards, log of herbicide use per hectare contributes negatively to female structural disadvantage indicating that returns to herbicide use is higher for women and is significant for the top 5 deciles except for the last.

South East and South South

Table 11 presents the aggregated RIF decomposition results at the mean, and at each decile of the productivity distribution for the South. The portion of the gap attributable to the endowment effect varies across the agricultural productivity distribution, with a large significant positive endowment effect in the lowest three deciles (0.75 to 0.92) a moderate significant effect in the middle of the distribution (0.20 to 0.42) and an insignificant effect in the highest three deciles. This is unlike the findings in the North where the endowment effect tends to be largest at the higher end of the agricultural productivity distribution.

Table 12 presents the detailed RIF decomposition at the 10^{th}, 50^{th}, and 90^{th} percentiles (to conserve space). Across the productivity distribution, household adult female pool coefficient is statistically significant and contributes negatively to the endowment effect for the top two deciles, thereby reducing the gap. As expected, log of land owned in hectares contributes negatively to the endowment effect at all points in the agricultural productivity distribution. However, the effect is highest for the lowest decile and reduces along the productivity distribution. Just like in the mean decomposition, the coefficient of log of herbicide use per hectare is statistically significant and contributes positively to the endowment effect across the productivity distribution except at the 40^{th} and 90^{th} percentiles. We have similar findings for the log of female family labor days per hectare which is statistically significant across the distribution except for the top two deciles and widens the gender gap.

At the 10^{th} percentile, child dependency ratio contributes positively to male structural advantage and female structural disadvantage thereby widening the gender gap. Male managed plots tend to

benefit more from having more children in the household than female managed plots. At the median, we find that schooling contributes negatively to both male structural advantage and female structural disadvantage. However, similar to our findings at the median, men get a lower return to schooling relative to women thus reducing the gap.

6. Robustness checks[17]

One of the violations of the assumptions of the decomposition method is omitted variable bias. There may be some unobservable characteristics that jointly determine agricultural productivity and the gender of the plot manager and other covariates. Given the limitation associated with using a cross sectional data and unavailability of an adequate instrumental variable, we follow Altonji et al. 2005 to assess the possibility of omitted variables. This is done by including additional covariates grouped by topic to our base model to test for the robustness of our specification. The expectation is that if the coefficients of the variables in our base model including the dummy variable for gender are largely unaffected, then it is unlikely that any unobservable characteristics not accounted for in the model will affect our main results. The following additional covariates were included (i) additional manager characteristics, (ii) additional plot characteristics, (iii) geospatial variables, (iv) crop fixed effects and (v) community level variables.[18] The results for the pooled regression, female only, and male only are presented in Tables 13-15 for the North and Tables 16-18 for the South, respectively. Largely, we found the estimates to be consistent in significance and sign across all models suggesting the robustness of our main results.

We carried out further robustness checks by looking at the sample of managers who grow certain common crops in the North (maize, sorghum and beans) and South (maize, cassava, and yam) using the quantity of harvest in kilogram. In the North we found that amongst managers growing maize, women produce 40 percent less than men. The estimates for the other crops were statistically insignificant.

As mentioned in the review of evidence, many studies examine gender differences in productivity using the gender of the household as the gender identifier. We explore the possibility that headship could affect productivity differences and thus examine the gender differences between plot managers who are also heads of households.[19] Again, this analysis is conducted separately for the North and the South (excluding the West) and corresponds to sensitivity analysis of column 1-6 of tables 5 and 6. We find that women plot managers who are also heads of

[17] Detailed results are available upon request

[18] The additional manager characteristics include hospitalization of manager in the past year, manager reported having difficulties with movement, manager has ability to sell plot, and relationship to the household head. The additional plot characteristics are presence of tree crop on plot, type of tenure of plot, and dummy to denote whether plot is irrigated or not. The geospatial variables include mean temperature of wettest quarter, annual precipitation (mm), plot's slope percentage, plot's elevation in meters, and potential wetness index. Dummies were included for each type of crop cultivated by the household in which the manager resides. Community level variables included are better credit availability compared to 5 years ago, presence of an agricultural cooperative in the local community, and occurrence of adverse shock to agriculture in the community.

[19] Note, we did not assign gender of head to all plots owned by the household, but rather limit the sample to plot managers who are also heads of the household.

households are 40.2 percent less productive than male managers who are also head of households. The gender difference is not significant for the South. Alternatively, we aggregated our analysis to the household level assigning the characteristics of the head. We found a much bigger gap at the household level in the North with a gap of 50 percent.[20] This could indicate that female managers in female headed households are worse off than female managers in male headed households. The difference remains insignificant for the South.

Given that 56 and 34 percent of male managers and female managers manage at least two plots respectively, we also examine productivity differences at the manager level by aggregating yield for each manager. We find that the gender differences are higher at the manager level compared with the plot level for the North. In the North region, male managers are 37.5 percent more productive than female managers while the results for the South are still insignificant even at the manager level.

7. Conclusion

In this paper, we examine gender-based productivity differences in Nigeria using a nationally representative data set. We examine if there are productivity differentials across male and female managed plots as well as which factors in the production process seem to be driving them. Given that agro-ecological and socioeconomic conditions differ so substantially across the North and South these are analyzed independently. Our analysis indicates that after controlling for observed manager characteristics and factors of production women in the North produce 27.4 percent less than men. We find that the unexplained portion of the gender gap in the North is bigger than the explained portion at the mean suggesting that even if provided with the same level of inputs, significant differences between the productivity of men and women would still emerge. This does not mean that women would not benefit from additional inputs, but that this will not completely make up differences.

In the South, statistically significant differences between the productivity of male and female plot managers productivity are not found once we control for observed factors of production. When the conditional differences are decomposed, we find that the endowment effect is more important than the structural effect indicating that access to resources explains most of the gender gap. In the South then, if women are given the same level of inputs as men the gap diminishes. Even though men use more input than women in general, women have smaller land plots and, as is generally the case on smaller plots, tend to use inputs at a higher proportional rate. If women's access to land assets were similar in the South, the gap between men and women would be much wider.

Overall, the results confirm our hypotheses that gender relationships differ across the North and South. The results mirror those found by Peterman et al. (2011), who found differences in the gender productivity link across agro-ecological zone in northern Nigeria, and Oladeebo and Fajuyigbe (2007) who find no statistically significant difference in the South-West. As such, it

[20] We lost lose some plots at the household level because of incomplete data.

suggests that policy should also vary by region. In particular, in the North it suggests not only providing greater input access to women but also exploring further the reasons for different returns to factors of production for women. In the South, again provision of inputs may help improve female agricultural productivity.

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Table 1: Manager's Sex by Zone

Region	*Manager's Sex*		
	Male	*Female*	*Total*
North Central	889	94	983
North East	1,102	101	1,203
North West	817	13	830
South East	369	260	629
South South	180	136	316
South West	248	31	279
	3,605	635	4,240

Table 2: Value of Harvest

Nigeria (excluding West)					
Variable Name	*All*	*Male*	*Female*	*Difference*	
Harvest Value (Naira)	112,561	125,107	65,897	59,210	***
Harvest Value (Naira)/HA	747,672	724,536	833,727	-109,191	
North East and North Central					
Variable Name	*All*	*Male*	*Female*	*Difference*	
Harvest Value (Naira)	127,004	134,689	50,629	84,060	***
Harvest Value (Naira)/HA	439,411	454,075	293,688	160,387	*
South East and South South					
Variable Name	*All*	*Male*	*Female*	*Difference*	
Harvest Value (Naira)	84,611	94,748	71,968	22,781	

Figure 1: Kernel Density Estimates of the Log of Value of Harvest per Hectare for Male- and Female-Managed Plot Samples, All Nigeria

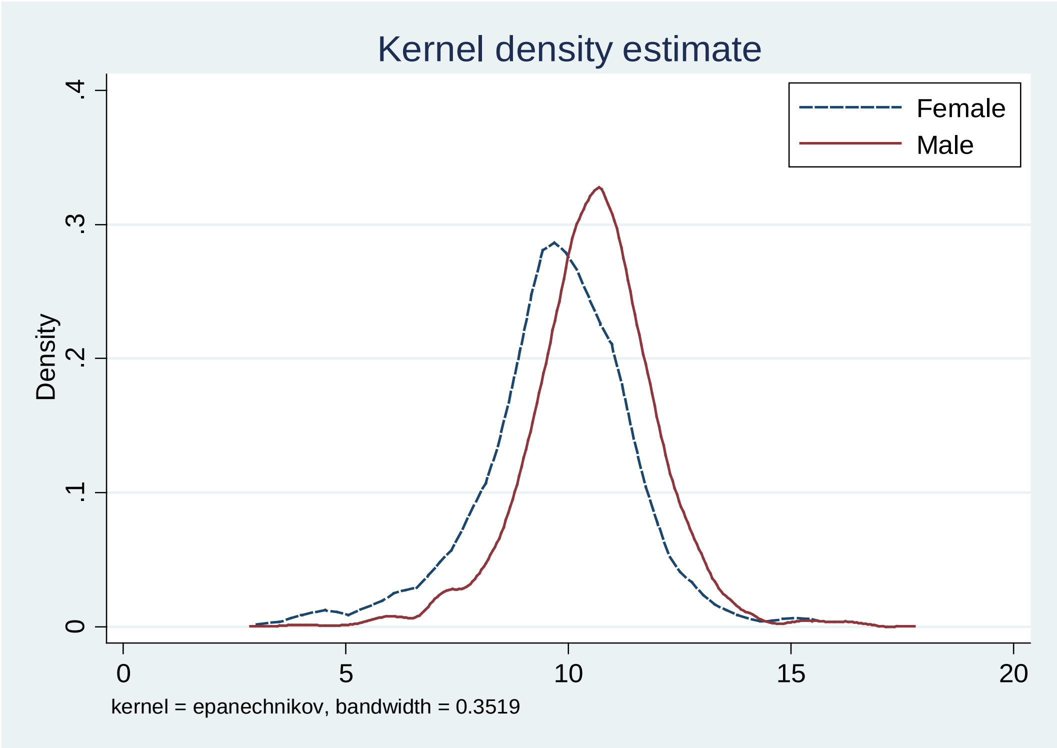

Figure 1a: Kernel Density Estimates of the Log of Value of Harvest per Hectare for Male- and Female-Managed Plot Samples, North

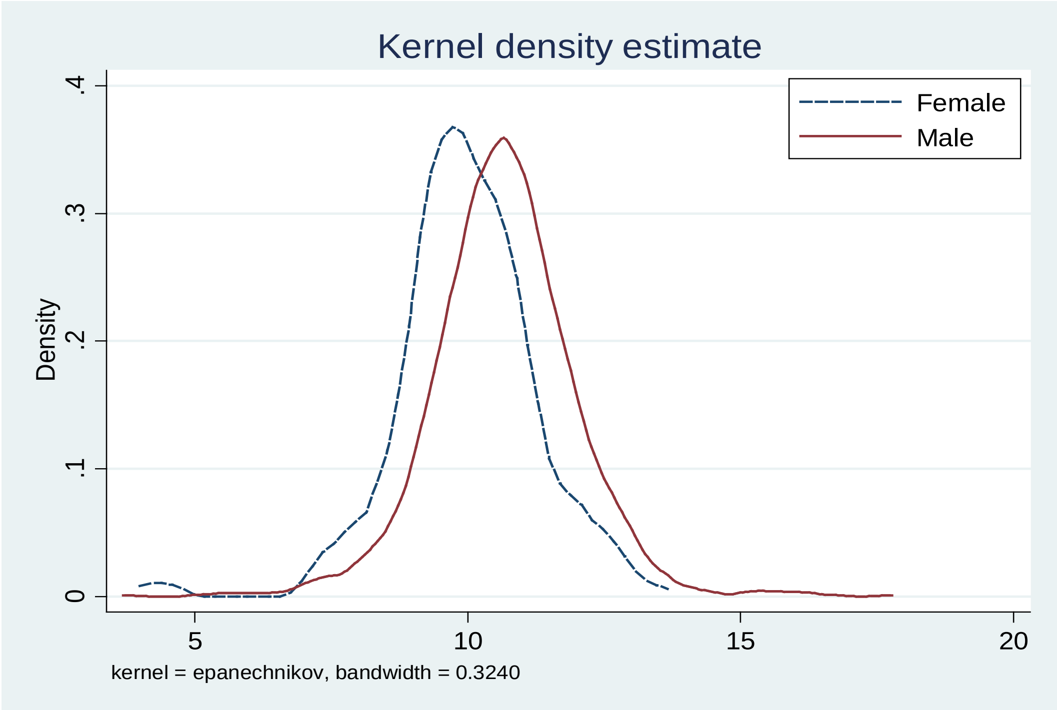

Figure 1b – Kernel Density Estimates of the Log of Value of Harvest per Hectare for Male- and Female-Managed Plot Samples, South

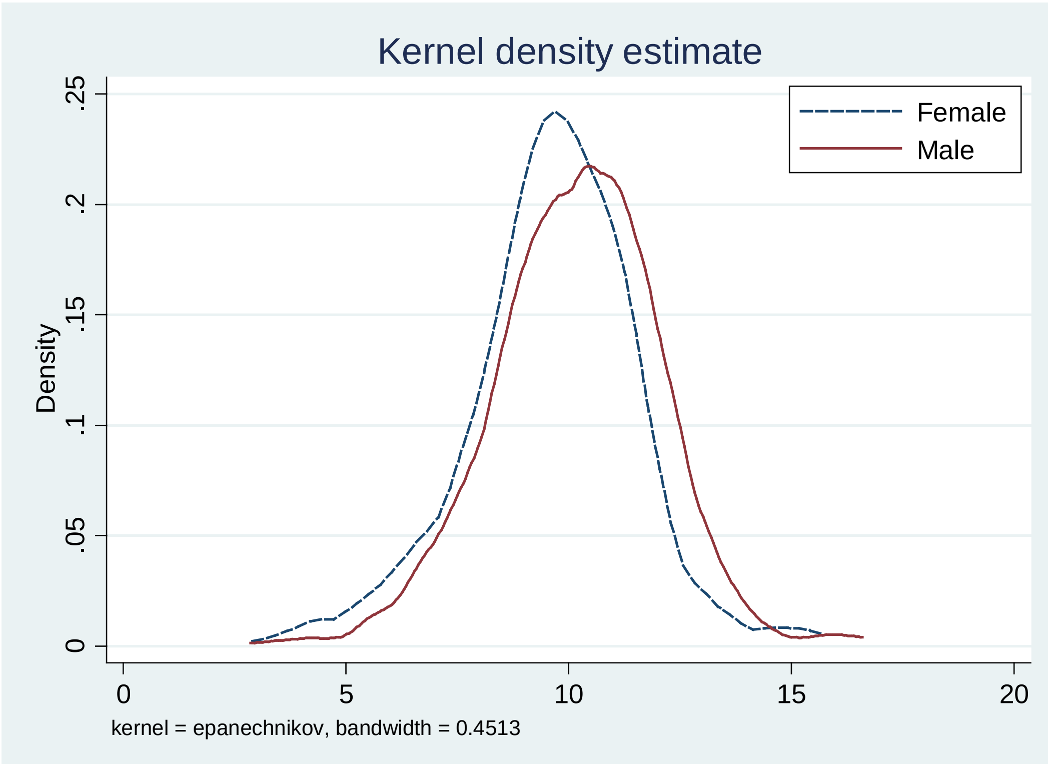

Table 3: Summary Statistics and Results from Tests & Mean Differences by Gender of the Plot Manager
North East and North Central

Variable Name	*All*	*Male*	*Female*	*Difference*	
Harvest Value (Naira)	127,004	134,689	50,629	84,060	***
Harvest Value (Naira)/HA	439,411	454,075	293,688	160,387	*
Manager's Characteristics					
Age	47.21	47.10	48.32	-1.22	
Non-Muslim†	0.54	0.51	0.78	-0.27	***
Years of schooling	4.76	5.02	2.22	2.80	***
Manager has nonfarm activity†	0.34	0.34	0.41	-0.08	
Household female adult size (age 12-60)	2.11	2.14	1.86	0.28	*
Household male adult size (age 12-60)	1.88	1.94	1.26	0.68	***
Child dependency ratio	0.83	0.85	0.62	0.23	***
Plot's Characteristics					
Land size in hectares	0.82	0.85	0.49	0.36	***
Plot distance to HH (Km)	4.47	4.65	2.71	1.94	
Access to extension†	0.09	0.09	0.08	0.02	
Agricultural Inputs					
Used fertilizer†	0.38	0.40	0.19	0.21	***
Fertilizer (kg)	49.82	53.02	18.03	34.99	***
Fertilizer (kg)/HA	129.29	130.98	112.54	18.44	
Fertilizer (kg)/HA (conditional on use)	336.35	324.35	587.79	-263.44	*
Used herbicide†	0.36	0.37	0.26	0.10	**
Herbicide (kg)	2.05	2.13	1.27	0.86	
Herbicide (kg)/HA	6.39	6.62	4.13	2.48	
Herbicide (kg)/HA (conditional on use)	17.87	18.03	15.72	2.31	
Used pesticide†	0.11	0.11	0.05	0.06	***
Pesticide (kg)	0.48	0.46	0.63	-0.17	
Pesticide (kg)/ HA	1.89	1.91	1.66	0.25	
Pesticide (kg)/HA (conditional on use)	17.65	16.98	32.33	-15.35	
Used purchased seed†	0.18	0.18	0.16	0.02	
Ag Capital (x1000 Naira)	12.22	12.64	8.03	4.61	
Ag Capital (x1000 Naira)/HA	37.38	37.84	32.79	5.05	
Cropping Strategies					
Grows cash crop†	0.13	0.13	0.17	-0.04	
Practices monocropping†	0.39	0.39	0.46	-0.07	
Labor					
Family labor					
Used male family labor †	0.81	0.85	0.48	0.37	***
Male family labor days	48.80	51.34	23.54	27.80	***
Male family labor days / HA	252.43	257.52	201.76	55.77	
Male family labor days / HA (Conditional on use)	309.99	303.71	420.27	-116.56	
Used female family labor	0.54	0.52	0.73	-0.21	***
Female family labor days	36.73	36.19	42.10	-5.91	
Female family labor days/HA	204.57	183.54	413.52	-229.97	**
Female family labor days/HA(Conditional on use)	379.79	353.12	569.54	-216.42	*
Used child family labor	0.21	0.21	0.21	0.00	
Child Family labor days	11.92	11.81	12.98	-1.17	
Child Family labor days/HA	52.37	51.00	66.03	-15.03	
Child Family labor days/HA (Conditional on use)	248.98	242.23	316.64	-74.41	

Table 3 (Cont'd)

Variable Name	*All*	*Male*	*Female*	*Difference*	
Hired labor					
Used hired male labor†	0.28	0.29	0.17	0.11	**
Hired male labor days	6.25	6.49	3.93	2.56	
Hired male labor days/HA	25.46	26.25	17.58	8.67	
Hired male labor days/HA (Conditional on use)	91.87	91.31	100.98	-9.67	
Used hired female labor†	0.14	0.14	0.14	0.00	
Hired female labor days	2.90	2.99	2.00	0.99	
Hired female labor days/HA	13.71	13.43	16.54	-3.11	
Hired female labor days/HA (Conditional on use)	100.46	98.33	121.81	-23.49	
Used hired child labor†	0.02	0.02	0.02	0.00	
Hired child labor days	0.77	0.81	0.44	0.37	
Hired child labor days/HA	2.39	2.36	2.68	-0.32	
Hired child labor days/HA (Conditional on use)	109.82	106.52	150.87	-44.36	
Number of observations	2,050	1,855	195		

Note.-*** indicates significance at 1% level, ** at 5% level, * at 10% level. † indicates dummy variable

Estimates are weighted.

Table 4: Summary Statistics and Results from Tests & Mean Differences by Gender of the Plot Manager South East and South South

Variable Name	*All*	*Male*	*Female*	*Difference*	
Harvest Value (Naira)	84,611	94,748	71,968	22,781	
Harvest Value (Naira)/HA	1,344,237	1,581,389	1,048,456	532,933	
Manager's Characteristics					
Age	54.11	55.08	52.91	2.17	
Non-Muslim†	0.98	0.97	1.00	-0.03	***
Years of schooling	5.90	6.97	4.57	2.40	***
Manager has nonfarm activity†	0.31	0.32	0.30	0.02	
Household female adult size (age 12-60)	1.84	1.95	1.71	0.25	*
Household male adult size (age 12-60)	1.53	1.63	1.40	0.24	**
Child dependency ratio	0.48	0.50	0.45	0.05	
Plot's Characteristics					
Land size in hectares	0.21	0.23	0.19	0.04	
Plot distance to HH (Km)	5.77	8.14	2.82	5.32	
Access to extension†	0.05	0.06	0.03	0.03	*
Agricultural Inputs					
Used fertilizer†	0.27	0.29	0.26	0.03	
Fertilizer (kg)	11.58	14.17	8.34	5.82	**
Fertilizer (kg)/HA	250.11	272.33	222.41	49.92	
Fertilizer (kg)/HA (conditional on use)	914.40	953.98	859.92	94.05	
Used herbicide†	0.04	0.06	0.02	0.04	***
Herbicide (kg)	0.27	0.37	0.14	0.23	*
Herbicide (kg)/HA	3.49	4.92	1.70	3.22	
Herbicide (kg)/HA (conditional on use)	83.58	80.12	99.00	-18.88	
Used pesticide†	0.04	0.05	0.03	0.01	
Pesticide (kg)	0.31	0.42	0.17	0.25	
Pesticide (kg)/ HA	6.48	8.73	3.66	5.07	
Pesticide (kg)/HA (conditional on use)	162.38	192.31	110.99	81.32	
Used purchased seed†	0.43	0.43	0.43	-0.01	
Ag Capital (x1000 Naira)	5.79	6.72	4.62	2.10	**
Ag Capital (x1000 Naira)/HA	138.22	143.91	131.12	12.78	
Cropping Strategies					
Grows cash crop†	0.11	0.13	0.09	0.03	
Practices monocropping†	0.16	0.17	0.15	0.02	
Labor					
Family labor					
Used male family labor †	0.59	0.78	0.36	0.42	***
Male family labor days	27.03	38.67	12.51	26.16	***
Male family labor days / HA	623.86	841.03	352.99	488.05	**
Male family labor days / HA (Conditional on use)	1057.79	1084.35	986.01	98.34	
Used female family labor	0.70	0.67	0.74	-0.07	*
Female family labor days	31.77	29.76	34.27	-4.51	
Female family labor days/HA	833.23	843.45	820.48	22.97	
Female family labor days/HA(Conditional on use)	1184.30	1252.43	1107.10	145.33	
Used child family labor	0.11	0.12	0.09	0.02	
Child Family labor days	2.65	2.79	2.47	0.32	
Child Family labor days/HA	67.51	73.76	59.70	14.06	
Child Family labor days/HA (Conditional on use)	639.27	639.89	638.31	1.59	

Table 4 (Cont'd)

Variable Name	*All*	*Male*	*Female*	*Difference*	
Hired labor					
Used hired male labor†	0.11	0.14	0.07	0.06	***
Hired male labor days	1.15	1.73	0.43	1.29	**
Hired male labor days/HA	10.82	13.36	7.66	5.70	
Hired male labor days/HA (Conditional on use)	98.88	97.22	102.71	-5.49	
Used hired female labor†	0.06	0.07	0.04	0.03	
Hired female labor days	0.38	0.53	0.19	0.34	**
Hired female labor days/HA	4.64	5.91	3.04	2.87	
Hired female labor days/HA (Conditional on use)	83.59	86.94	76.45	10.49	
Used hired child labor†	0.00	0.00	0.01	-0.01	*
Hired child labor days	0.03	0.00	0.07	-0.07	
Hired child labor days/HA	0.09	0.00	0.21	-0.21	
Hired child labor days/HA (Conditional on use)	34.57	0.00	34.57	-34.57	
Number of observations	945	549	396		

Note.-*** indicates significance at 1% level, ** at 5% level, * at 10% level. † indicates dummy variable
Estimates are weighted.

Table 5: Differences in Northern Nigeria (excluding the west)
Dependent variable: Log [Value of harvest per hectare]

VARIABLES				*Pooled sample*				*Female manager*	*Male Manager*
	(0)	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Female manager=1	-0.0389	-0.103	-0.0272	-0.379***	-0.372***	-0.297***	-0.274***		
	(0.121)	(0.121)	(0.125)	(0.101)	(0.100)	(0.0999)	(0.103)		
Age			-0.00481	0.00370	-0.00184	-0.00461	-0.00647	0.0728**	-0.0148
			(0.0150)	(0.0131)	(0.0129)	(0.0130)	(0.0130)	(0.0357)	(0.0142)
Age Squared			4.73e-05	-4.48e-05	1.06e-05	2.97e-05	3.90e-05	-0.000879**	0.000124
			(0.000146)	(0.000127)	(0.000125)	(0.000127)	(0.000128)	(0.000381)	(0.000137)
Years of schooling			0.00590	-0.00344	-0.00203	-0.00622	-0.00859	-0.0122	-0.00735
			(0.00687)	(0.00593)	(0.00587)	(0.00593)	(0.00586)	(0.0291)	(0.00601)
Manager is nonmuslim†			-0.0222	-0.0811	-0.0723	-0.109	-0.0320	-0.487*	-0.00958
			(0.108)	(0.0915)	(0.0906)	(0.0901)	(0.0903)	(0.278)	(0.0955)
Manager has nonfarm activity†			0.00866	-0.00902	-0.00129	-0.0244	-0.0570	0.343	-0.0848
			(0.0706)	(0.0583)	(0.0579)	(0.0581)	(0.0578)	(0.262)	(0.0604)
Household female adult size (age 12-60)			0.0536**	0.0830***	0.0828***	0.0447**	0.0367*	-0.178	0.0384*
			(0.0251)	(0.0218)	(0.0211)	(0.0219)	(0.0221)	(0.108)	(0.0227)
Household male adult size (age 12-60)			0.0601**	0.0675***	0.0740***	0.0556**	0.0677***	0.0463	0.0679***
			(0.0288)	(0.0244)	(0.0236)	(0.0229)	(0.0227)	(0.0933)	(0.0245)
Child dependency ratio			0.00211	0.0164	0.0192	0.00898	-0.00260	0.0187	-0.00448
			(0.0491)	(0.0426)	(0.0433)	(0.0410)	(0.0393)	(0.130)	(0.0421)
Log [GPS-Land Area (HA)]				-0.788***	-0.803***	-0.725***	-0.711***	-0.723***	-0.704***
				(0.0395)	(0.0398)	(0.0408)	(0.0414)	(0.185)	(0.0425)
Log [GPS-Land Area (HA) Squared]				-0.0432***	-0.0439***	-0.0414***	-0.0452***	-0.0251	-0.0517***
				(0.0146)	(0.0149)	(0.0147)	(0.0149)	(0.0565)	(0.0160)
Plot distance to household				0.000271	0.000224	0.000233	0.000268	0.00996	0.000304
				(0.000279)	(0.000244)	(0.000193)	(0.000229)	(0.00862)	(0.000227)
Access to extension†				0.142	0.180*	0.154*	0.124	0.178	0.131
				(0.0958)	(0.0957)	(0.0913)	(0.0891)	(0.320)	(0.0950)
Grows cash crop†					0.0449	0.0980	0.0944	0.574**	0.0559
					(0.0691)	(0.0691)	(0.0696)	(0.280)	(0.0728)
Only one crop on plot †					-0.424***	-0.456***	-0.454***	-0.161	-0.472***
					(0.0624)	(0.0622)	(0.0615)	(0.198)	(0.0647)

Table 5 (Cont'd)

VARIABLES									
Log [Qty of fertilizer (kg)/ha]						0.0609***	0.0532***	0.0486	0.0531***
						(0.0115)	(0.0113)	(0.0445)	(0.0118)
Log [Herbicide (kg)/ha]						0.0516*	0.0449	0.129	0.0396
						(0.0296)	(0.0290)	(0.0872)	(0.0310)
Log [Pesticide (kg)/ha]						-0.0395	-0.0546	0.00982	-0.0605
						(0.0395)	(0.0393)	(0.106)	(0.0407)
Used purchased seed†						-0.116*	-0.120*	0.210	-0.138**
						(0.0624)	(0.0616)	(0.209)	(0.0661)
Log [Ag capital/ha (x1000 Naira)]						0.0698***	0.0663***	0.136*	0.0676***
						(0.0203)	(0.0202)	(0.0779)	(0.0212)
Log [Male family labor (days)/ha]							-0.000138	0.0114	-0.00296
							(0.0166)	(0.0374)	(0.0190)
Log [Female family labor (days)/ha]							-0.000242	-0.0298	0.00241
							(0.0166)	(0.0480)	(0.0181)
Log [Child family labor (days)/ha]							0.0117	0.0298	0.0118
							(0.0151)	(0.0404)	(0.0163)
Log [Hired male labor (days)/ha]							0.114***	0.175**	0.115***
							(0.0203)	(0.0773)	(0.0209)
Log [Hired female labor (days)/ha]							0.0337	0.0265	0.0237
							(0.0241)	(0.0829)	(0.0256)
Log [Hired children labor (days)/ha]							-0.0390	-0.00687	-0.0639
							(0.0514)	(0.178)	(0.0520)
Constant	11.38***	11.20***	11.03***	10.17***	10.51***	10.58***	10.54***	9.038***	10.73***
	(0.0351)	(0.0868)	(0.369)	(0.325)	(0.326)	(0.327)	(0.332)	(0.893)	(0.358)
State fixed effects	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,050	2,050	2,050	2,050	2,050	2,050	2,050	195	1,855
R-squared	0.000	0.082	0.089	0.355	0.372	0.389	0.405	0.583	0.397

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable

Table 6: Productivity Differentials in Southern Nigeria (excluding the West)
Dependent variable: Log [Value of harvest per hectare]

VARIABLES	*Pooled sample*							*Female manager*	*Male Manager*
	(0)	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Female manager=1	-0.239*	-0.0856	-0.0284	-0.119	-0.138	-0.127	0.0484		
	(0.125)	(0.120)	(0.127)	(0.115)	(0.114)	(0.112)	(0.132)		
Age			-0.0159	0.00407	8.06e-05	0.00197	0.00817	0.0467	-0.000624
			(0.0226)	(0.0204)	(0.0204)	(0.0203)	(0.0201)	(0.0376)	(0.0240)
Age Squared			0.000128	-4.06e-05	2.82e-06	-3.25e-05	-7.37e-05	-0.000549	8.49e-05
			(0.000199)	(0.000179)	(0.000180)	(0.000179)	(0.000177)	(0.000339)	(0.000210)
Years of schooling			0.0117	0.00958	0.00669	0.00186	0.00339	0.0202	-0.0121
			(0.0133)	(0.0119)	(0.0119)	(0.0117)	(0.0117)	(0.0187)	(0.0155)
Manager is nonmuslim†			-0.101	-0.314	-0.219	-0.314	-0.380		-0.246
			(0.381)	(0.322)	(0.334)	(0.338)	(0.342)		(0.401)
Manager has nonfarm activity†			0.232*	0.132	0.128	0.130	0.125	0.136	0.125
			(0.131)	(0.121)	(0.120)	(0.119)	(0.120)	(0.192)	(0.157)
Household female adult size (age 12-60)			-0.0727*	-0.0588	-0.0515	-0.0960**	-0.0962**	-0.127**	-0.108**
			(0.0437)	(0.0386)	(0.0378)	(0.0383)	(0.0384)	(0.0647)	(0.0521)
Household male adult size (age 12-60)			0.0891*	0.0771*	0.0906**	0.0881**	0.0739*	-0.00777	0.122**
			(0.0487)	(0.0430)	(0.0428)	(0.0432)	(0.0431)	(0.0652)	(0.0603)
Child dependency ratio			0.0162	0.00755	0.0105	-0.0454	-0.0449	-0.208	0.131
			(0.125)	(0.109)	(0.108)	(0.107)	(0.108)	(0.182)	(0.131)
Log [GPS-Land Area (HA)]				-0.835***	-0.873***	-0.766***	-0.746***	-0.828***	-0.804***
				(0.132)	(0.129)	(0.135)	(0.139)	(0.285)	(0.140)
Log [GPS-Land Area (HA) Squared]				-0.0246	-0.0271	-0.0249	-0.0230	-0.0220	-0.0418
				(0.0273)	(0.0269)	(0.0268)	(0.0269)	(0.0536)	(0.0275)
Plot distance to household				0.00129	0.00118	0.00103	0.000950	0.00190***	0.000748
				(0.000841)	(0.000848)	(0.000645)	(0.000661)	(0.000505)	(0.000898)
Access to extension†				0.246	0.362*	0.269	0.305	0.312	0.284
				(0.212)	(0.216)	(0.223)	(0.230)	(0.481)	(0.280)
Grows cash crop†					-0.0187	-0.00755	-0.0235	0.0821	-0.0357
					(0.187)	(0.180)	(0.180)	(0.292)	(0.236)
Only one crop on plot †					-0.719***	-0.666***	-0.640***	-0.679**	-0.573***
					(0.143)	(0.142)	(0.141)	(0.281)	(0.163)

Table 6 (Cont'd)

VARIABLES									
Log [Qty of fertilizer (kg)/ha]						0.0875***	0.0861***	0.104***	0.0651***
						(0.0190)	(0.0191)	(0.0328)	(0.0251)
Log [Herbicide (kg)/ha]						0.216***	0.241***	0.247**	0.235**
						(0.0776)	(0.0784)	(0.0995)	(0.108)
Log [Pesticide (kg)/ha]						-0.109	-0.133*	-0.0833	-0.187*
						(0.0697)	(0.0712)	(0.0928)	(0.105)
Used purchased seed†						0.0804	0.0640	0.112	0.000556
						(0.112)	(0.110)	(0.178)	(0.145)
Log [Ag capital/ha (x1000 Naira)]						0.104**	0.0841*	0.0774	0.0572
						(0.0494)	(0.0497)	(0.0681)	(0.0771)
Log [Male family labor (days)/ha]							0.0635***	0.0278	0.103***
							(0.0224)	(0.0330)	(0.0334)
Log [Female family labor (days)/ha]							-0.0137	-0.00405	-0.0410
							(0.0226)	(0.0343)	(0.0303)
Log [Child family labor (days)/ha]							0.00882	0.0556	-0.0184
							(0.0262)	(0.0417)	(0.0368)
Log [Hired male labor (days)/ha]							0.0598	0.0152	0.113**
							(0.0464)	(0.0928)	(0.0519)
Log [Hired female labor (days)/ha]							0.00112	0.0667	-0.0708
							(0.0693)	(0.125)	(0.0754)
Log [Hired children labor (days)/ha]							-0.322	-0.215	
							(0.356)	(0.409)	
Constant	12.53***	12.01***	12.39***	9.899***	9.806***	9.713***	9.461***	8.430***	9.223***
	(0.0803)	(0.178)	(0.709)	(0.670)	(0.667)	(0.668)	(0.669)	(1.058)	(0.805)
State fixed effects	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	945	945	945	945	945	945	945	396	549
R-squared	0.004	0.175	0.186	0.337	0.354	0.377	0.386	0.386	0.418

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable

Table 7

Oaxaca decomposition of log value of output per hectare: North (excluding the west)

A. Mean Gender differential			
Mean Male Managed plot Agricultural Productivity	11.38***		
	(0.0351)		
Mean Female managed plot Agricultural Productivity	11.34***		
	(0.116)		
Mean Gender Differential in agricultural Productivity	0.0389		
	(0.121)		

B. Aggregate Decomposition	*Endowment effect*	*Male structural advantage*	*Female structural disadvantage*
Total	-0.235***	-0	0.274***
	(0.0875)	(0.00175)	(0.102)
Share of the Gender Differential	-604%	0%	704%

C. Detailed decomposition	*Endowment effect*	*Male structural advantage*	*Female structural disadvantage*
Age	0.0107	-0.385**	-3.808**
	(0.0224)	(0.169)	(1.587)
Age Squared	-0.00567	0.200**	2.290***
	(0.0189)	(0.0864)	(0.872)
Years of schooling	-0.0242	0.00626	0.00796
	(0.0166)	(0.00622)	(0.0584)
Manager is nonmuslim†	0.00884	0.0107	0.343*
	(0.0247)	(0.00995)	(0.193)
Manager has nonfarm activity†	0.00203	-0.00986	-0.156*
	(0.00292)	(0.00674)	(0.0905)
Household female adult size (age 12-60)	0.0102	0.00370	0.392**
	(0.00692)	(0.0143)	(0.177)
Household male adult size (age 12-60)	0.0446***	0.000341	0.0264
	(0.0163)	(0.0111)	(0.104)
Child dependency ratio	-0.000616	-0.00163	-0.0134
	(0.00922)	(0.0106)	(0.0734)
Log [GPS-Land Area (HA)]	-0.432***	-0.00524	-0.0167
	(0.0682)	(0.0113)	(0.221)
Log [GPS-Land Area (HA) Squared]	0.0631**	-0.0124	-0.0664
	(0.0245)	(0.0106)	(0.164)
Plot distance to household	0.000780	0.000214	-0.0292
	(0.000802)	(0.000199)	(0.0245)
Access to extension†	0.000883	0.000820	-0.00530
	(0.00284)	(0.00293)	(0.0275)
Grows cash crop†	-0.00600	-0.00524	-0.0960*
	(0.00521)	(0.00384)	(0.0507)
Only one crop on plot †	0.0255	-0.00725	-0.132*
	(0.0174)	(0.00878)	(0.0784)
Log [Qty of fertilizer (kg)/ha]	0.0433***	-0.000227	0.00535
	(0.0131)	(0.00551)	(0.0461)
Log [Herbicide (kg)/ha]	0.00427	-0.00378	-0.0512
	(0.00480)	(0.00462)	(0.0488)
Log [Pesticide (kg)/ha]	-0.00122	-0.00108	-0.0102
	(0.00302)	(0.00158)	(0.0162)
Used purchased seed†	0.000461	-0.00454	-0.0828*
	(0.00393)	(0.00462)	(0.0483)

Table 7 (Cont'd)

Detailed decomposition	*Endowment effect*	*Male structural advantage*	*Female structural disadvantage*
Log [Ag capital/ha (x1000 Naira)]	0.00763	0.00273	-0.138
	(0.00877)	(0.0120)	(0.137)
Log [Male family labor (days)/ha]	-0.000157	-0.00960	-0.0260
	(0.0187)	(0.0275)	(0.0729)
Log [Female family labor (days)/ha]	0.000325	0.00570	0.103
	(0.0221)	(0.0137)	(0.147)
Log [Child family labor (days)/ha]	-0.000793	6.42e-05	-0.0163
	(0.00200)	(0.00419)	(0.0326)
Log [Hired male labor (days)/ha]	0.0382***	0.000584	-0.0354
	(0.0144)	(0.00496)	(0.0402)
Log [Hired female labor (days)/ha]	-0.00151	-0.00446	0.00353
	(0.00375)	(0.00366)	(0.0360)
Log [Hired children labor (days)/ha]	0.000156	-0.00169	-0.00231
	(0.00170)	(0.00147)	(0.0111)
Constant		0.192**	1.499*
		(0.0823)	(0.829)
Observations	2.050	2.050	2.050

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † Indicates dummy variable

Table 8

Oaxaca decomposition of log value of output per hectare: South (excluding the west)

A. Mean Gender differential			
Mean Male Managed plot		12.53***	
Agricultural Productivity		(0.0802)	
Mean Female managed plot		12.29***	
Agricultural Productivity		(0.0963)	
Mean Gender Differential		0.239*	
in agricultural Productivity		(0.125)	
B. Aggregate Decomposition	Endowment Effect	Male Structural Advantage	Female Structural Disadvantage
Total	0.287***	-0	-0.0484
	(0.111)	(0.0144)	(0.130)
Share of the Gender Differential	120%	0%	-20%
C. Detailed Decomposition	Endowment Effect	Male Structural Advantage	Female Structural Disadvantage
Age	0.0148	-0.480	-2.037
	(0.0366)	(1.034)	(1.453)
Age Squared	-0.0160	0.510	1.424*
	(0.0386)	(0.534)	(0.764)
Years of schooling	0.00647	-0.102*	-0.0793
	(0.0219)	(0.0591)	(0.0762)
Manager is nonmuslim†	0.0104	0.130	-0.380
	(0.00955)	(0.157)	(0.336)
Manager has nonfarm activity†	0.00134	-1.21e-06	-0.00301
	(0.00392)	(0.0309)	(0.0390)
Household female adult size (age 12-60)	-0.0249*	-0.0236	0.0536
	(0.0131)	(0.0692)	(0.0854)
Household male adult size (age 12-60)	0.0189	0.0790	0.114
	(0.0125)	(0.0626)	(0.0726)
Child dependency ratio	-0.00365	0.0924*	0.0724
	(0.00880)	(0.0526)	(0.0565)
Log [GPS-Land Area (HA)]	-0.215***	0.141	-0.225
	(0.0742)	(0.310)	(0.508)
Log [GPS-Land Area (HA) Squared]	0.0268	-0.148	-0.00854
	(0.0321)	(0.183)	(0.322)
Plot distance to household	0.00293	-0.00120	-0.00272
	(0.00333)	(0.00298)	(0.00291)
Access to extension†	0.00875	-0.00121	-0.000208
	(0.00758)	(0.00800)	(0.0114)
Grows cash crop†	-0.000211	-0.00132	-0.0104
	(0.00166)	(0.0166)	(0.0214)
Only one crop on plot †	-0.0193	0.0119	0.00573
	(0.0160)	(0.0199)	(0.0305)
Log [Qty of fertilizer (kg)/ha]	-4.88e-05	-0.0391	-0.0339
	(0.0164)	(0.0295)	(0.0481)
Log [Herbicide (kg)/ha]	0.0310**	-0.00129	-0.000517
	(0.0150)	(0.0111)	(0.00805)
Log [Pesticide (kg)/ha]	-0.00356	-0.00856	-0.00649
	(0.00727)	(0.00997)	(0.0112)
Used purchased seed†	0.00171	-0.0350	-0.0254
	(0.00357)	(0.0519)	(0.0710)

Table 8 (Cont'd)

C. Detailed Decomposition	Endowment Effect	Male Structural Advantage	Female Structural Disadvantage
Log [Ag capital/ha (x1000 Naira)]	-0.00111	-0.0986	0.0248
	(0.00974)	(0.179)	(0.199)
Log [Male family labor (days)/ha]	0.142***	0.162	0.0662
	(0.0503)	(0.101)	(0.0450)
Log [Female family labor (days)/ha]	0.00940	-0.0962	-0.0407
	(0.0154)	(0.0783)	(0.107)
Log [Child family labor (days)/ha]	0.000458	-0.0147	-0.0228
	(0.00163)	(0.0125)	(0.0169)
Log [Hired male labor (days)/ha]	0.0102	0.0272	0.0153
	(0.00916)	(0.0212)	(0.0230)
Log [Hired female labor (days)/ha]	8.31e-05	-0.0167	-0.0104
	(0.00505)	(0.0132)	(0.0146)
Log [Hired children labor (days)/ha]	0.00898	0	-0.00299
	(0.0108)	(0)	(0.00335)
Constant		-0.238	1.031
		(0.583)	(0.812)
Observations	945	945	945

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable

Table 9

RIF estimates, North (excluding the west)

	mean	*10th Percentile*	*20th Percentile*	*30th Percentile*	*40th Percentile*	*50th Percentile*	*60th Percentile*	*70th Percentile*	*80th Percentile*	*90th Percentile*
A. Gender Differential										
Male Managed plot	11.38***	9.619***	10.21***	10.64***	11.04***	11.33***	11.67***	12.05***	12.49***	13.28***
	(0.0351)	(0.0573)	(0.0491)	(0.0411)	(0.0392)	(0.0301)	(0.0403)	(0.0369)	(0.0492)	(0.0547)
Female managed plot	11.34***	9.694***	10.33***	10.66***	10.97***	11.26***	11.67***	12.06***	12.61***	13.31***
	(0.116)	(0.150)	(0.0833)	(0.120)	(0.0815)	(0.123)	(0.115)	(0.193)	(0.148)	(0.140)
Gender Differential	0.0389	-0.0754	-0.117	-0.0128	0.0761	0.0695	-0.00590	-0.0101	-0.116	-0.0308
	(0.121)	(0.161)	(0.0967)	(0.127)	(0.0904)	(0.126)	(0.122)	(0.197)	(0.156)	(0.150)
B. Aggregate Decomposition										
Endowment Effect	-0.235***	-0.0248	-0.0694	-0.183**	-0.263***	-0.224***	-0.216**	-0.237**	-0.302**	-0.415***
	(0.0875)	(0.109)	(0.0924)	(0.0841)	(0.0791)	(0.0691)	(0.0885)	(0.0970)	(0.118)	(0.130)
Share of the Gender Differential	-604%	33%	59%	1430%	-346%	-322%	3661%	2347%	260%	1347%
Male Structural Advantage	-0	0	0	-0	-0	0	-0	-0	-0	-0
	(0.00175)	(0.00296)	(0.00144)	(0.00142)	(0.00122)	(0.00193)	(0.00159)	(0.00426)	(0.00369)	(0.00277)
Share of the Gender Differential	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Female Structural Advantage	0.274***	-0.0506	-0.0477	0.170	0.339***	0.293**	0.210*	0.227	0.186	0.384**
	(0.102)	(0.166)	(0.110)	(0.127)	(0.0937)	(0.116)	(0.119)	(0.176)	(0.146)	(0.157)
Share of the Gender Differential	704%	67%	41%	1328%	446%	422%	-3559%	-2248%	160%	-1247%
Observations						**2050**				

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable

Table 10: Detailed RIF estimates North (excluding the west)

A. Gender Differential	***Mean***	***10th Percentile***	***50th Percentile***	***90th Percentile***
Male Managed plot	11.38***	9.619***	11.33***	13.28***
	(0.0351)	(0.0573)	(0.0301)	(0.0547)
Female managed plot	11.34***	9.694***	11.26***	13.31***
	(0.116)	(0.150)	(0.123)	(0.140)
Gender Differential	0.0389	-0.0754	0.0695	-0.0308
	(0.121)	(0.161)	(0.126)	(0.150)

B. Aggregate Decomposition	*Endowment Effect*				*Male Structural Advantage*				*Female Structural Disadvantage*			
	mean	*10th*	*50th*	*90th*	*mean*	*10th*	*50th*	*90th*	*mean*	*10th*	*50th*	*90th*
Total	-0.235***	-0.0248	-0.224***	-0.415***	-0	0	0	-0	0.274***	-0.0506	0.293**	0.384**
	(0.0875)	(0.109)	(0.0691)	(0.130)	(0.00175)	(0.00296)	(0.00193)	(0.00277)	(0.102)	(0.166)	(0.116)	(0.157)
Share of the Gender Differential	-604%	33%	-322%	1347%	0%	0%	0%	0%	704%	67%	422%	-1247%
C. Detailed Decomposition	*Endowment Effect*				*Male Structural Advantage*				*Female Structural Disadvantage*			
	mean	*10th*	*50th*	*90th*	*mean*	*10th*	*50th*	*90th*	*mean*	*10th*	*50th*	*90th*
Age	0.0107	0.0588	-0.00455	0.0148	-0.385**	-0.489	-0,265	0,0541	-3.808**	-4.271	-2.650	-1.149
	(0.0224)	(0.0498)	(0.0191)	(0.0406)	(0.169)	(0.308)	(0.225)	(0.242)	(1.587)	(2.981)	(2.045)	(2.032)
Age Squared	-0.00567	-0.0496	0.00668	-0.0113	0.200**	0.315*	0.151	-0.0570	2.290***	3.118*	1.632	0.920
	(0.0189)	(0.0453)	(0.0169)	(0.0367)	(0.0864)	(0.162)	(0.109)	(0.118)	(0.872)	(1.705)	(1.099)	(1.130)
Years of schooling	-0.0242	0.0323	-0.0251	-0.0520*	0.00626	0.0311***	0.00623	-0.0176	0.00796	0.132	0.0103	-0.0672
	(0.0166)	(0.0284)	(0.0160)	(0.0308)	(0.00622)	(0.00998)	(0.00778)	(0.0113)	(0.0584)	(0.110)	(0.0887)	(0.0821)
Manager is nonmuslim†	0.00884	-0.0232	-0.0153	-0.0311	0.0107	0.0133	0.0103	0.0206	0.343*	0.351	0.148	0.412
	(0.0247)	(0.0439)	(0.0221)	(0.0441)	(0.00995)	(0.0211)	(0.0137)	(0.0158)	(0.193)	(0.414)	(0.286)	(0.276)
Manager has nonfarm activity†	0.00203	0.00531	-0.000680	0.00615	-0.00986	-0.00906	-0.00859	0.00345	-0.156*	-0.0944	-0.0759	0.0265
	(0.00292)	(0.00671)	(0.00218)	(0.00726)	(0.00674)	(0.0102)	(0.00836)	(0.0110)	(0.0905)	(0.112)	(0.106)	(0.122)
Household female adult size (age 12-60)	0.0102	0.0133	0.00378	0.00488	0.00370	-0.0152	-0.00828	0.0626***	0.392**	0.223	0.319	0.835***
	(0.00692)	(0.0120)	(0.00632)	(0.0108)	(0.0143)	(0.0207)	(0.0165)	(0.0231)	(0.177)	(0.271)	(0.248)	(0.295)
Household male adult size (age 12-60)	0.0446***	0.0826***	0.0204	0.0541*	0.000341	0.00965	0.00452	-0.0130	0.0264	-0.0562	0.0753	0.119
	(0.0163)	(0.0280)	(0.0148)	(0.0291)	(0.0111)	(0.0193)	(0.0167)	(0.0176)	(0.104)	(0.167)	(0.159)	(0.161)
Child dependency ratio	-0.000616	0.0155	-0.00827	-0.00327	-0.00163	0.0188	0.0157	0.00135	-0.0134	0.0511	0.148	0.159
	(0.00922)	(0.0245)	(0.00822)	(0.0156)	(0.0106)	(0.0183)	(0.0134)	(0.0193)	(0.0734)	(0.140)	(0.101)	(0.129)
Log [GPS-Land Area (HA)]	-0.432***	-0.685***	-0.285***	-0.173***	-0.00524	-0.0307*	-0.000472	0.0364***	-0.0167	-0.404	0.161	0.722***
	(0.0682)	(0.115)	(0.0471)	(0.0446)	(0.0113)	(0.0183)	(0.00866)	(0.0131)	(0.221)	(0.338)	(0.201)	(0.223)
Log [GPS-Land Area (HA) Squared]	0.0631**	0.359***	0.0238	-0.225***	-0.0124	-0.00228	-0.0172**	-0.0209	-0.0664	-0.0350	-0.228*	-0.527**
	(0.0245)	(0.0839)	(0.0173)	(0.0611)	(0.0106)	(0.0146)	(0.00846)	(0.0214)	(0.164)	(0.221)	(0.124)	(0.220)
Plot distance to household	0.000780	0.00233	0.000607	0.00109	0.000214	0.000667**	4.31e-05	1.08e-05	-0.0292	0.00897	-0.0497*	-0.0368
	(0.000802)	(0.00193)	(0.000780)	(0.00295)	(0.000199)	(0.000272)	(0.000231)	(0.000322)	(0.0245)	(0.0183)	(0.0294)	(0.0421)
Access to extension†	0.000883	0.000499	-0.000691	0.00151	0.000820	-0.00487	0.00254	-0.00163	-0.00530	-0.0543	0.00724	-0.0412
	(0.00284)	(0.00191)	(0.00226)	(0.00485)	(0.00293)	(0.00331)	(0.00386)	(0.00503)	(0.0275)	(0.0366)	(0.0381)	(0.0426)

Table 10 (Cont'd)

C. Detailed Decomposition	*Endowment Effect*				*Male Structural Advantage*				*Female Structural Disadvantage*			
	mean	*10th*	*50th*	*90th*	*mean*	*10th*	*50th*	*90th*	*mean*	*10th*	*50th*	*90th*
Grows cash crop†	-0.00600	-0.0113	-0.00714	0.00717	-0.00524	-0.00670	-0.0108**	-0.00223	-0.0960*	-0.0518	-0.166***	-0.0507
	(0.00521)	(0.0104)	(0.00588)	(0.00808)	(0.00384)	(0.00594)	(0.00490)	(0.00534)	(0.0507)	(0.0716)	(0.0583)	(0.0773)
Only one crop on plot †	0.0255	0.0290	0.0112	0.0308	-0.00725	0.00981	-0.00960	-0.0188	-0.132*	0.0678	-0.109	-0.312**
	(0.0174)	(0.0204)	(0.00810)	(0.0214)	(0.00878)	(0.0132)	(0.00967)	(0.0130)	(0.0784)	(0.120)	(0.0922)	(0.123)
Log [Qty of fertilizer (kg)/ha]	0.0433***	0.0452***	0.0263**	0.0269	-0.000227	0.00460	0.00649	-0.00607	0.00535	0.0423	0.0424	-0.00388
	(0.0131)	(0.0171)	(0.0105)	(0.0185)	(0.00551)	(0.00823)	(0.00717)	(0.0116)	(0.0461)	(0.0849)	(0.0625)	(0.0755)
Log [Herbicide (kg)/ha]	0.00427	0.00500	0.00504	0.000601	-0.00378	-0.00145	-0.00774	-0.0122	-0.0512	-0.0432	-0.146**	-0.0320
	(0.00480)	(0.00593)	(0.00518)	(0.00480)	(0.00462)	(0.00607)	(0.00570)	(0.00854)	(0.0488)	(0.0773)	(0.0662)	(0.0773)
Log [Pesticide (kg)/ha]	-0.00122	0.000768	0.000423	-0.00237	-0.00108	0.00144	-0.00113	-0.00269	-0.0102	-0.0210	-0.00831	0.00191
	(0.00302)	(0.00215)	(0.00131)	(0.00591)	(0.00158)	(0.00153)	(0.00212)	(0.00388)	(0.0162)	(0.0209)	(0.0256)	(0.0304)
Used purchased seed†	0.000461	0.000911	0.000350	1.25e-05	-0.00454	-0.0141	0.000299	0.0113	-0.0828*	-0.142*	-0.0536	0.0561
	(0.00393)	(0.00777)	(0.00298)	(0.000422)	(0.00462)	(0.00948)	(0.00633)	(0.00793)	(0.0483)	(0.0813)	(0.0643)	(0.0884)
Log [Ag capital/ha (x1000 Naira)]	0.00763	0.00460	0.00758	0.00322	0.00273	0.0308	-0.0215	-0.00824	-0.138	0.237	-0.376**	-0.209
	(0.00877)	(0.00669)	(0.00868)	(0.00542)	(0.0120)	(0.0230)	(0.0143)	(0.0189)	(0.137)	(0.247)	(0.180)	(0.209)
Log [Male family labor (days)/ha]	-0.000157	-0.0303	0.00286	-0.0423	-0.00960	-0.00105	-0.00753	-0.0450	-0.0260	-0.0551	-0.0314	-0.00137
	(0.0187)	(0.0288)	(0.0177)	(0.0364)	(0.0275)	(0.0374)	(0.0315)	(0.0497)	(0.0729)	(0.0975)	(0.0979)	(0.133)
Log [Female family labor (days)/ha]	0.000325	0.0228	0.0112	-0.0281	0.00570	-0.00544	0.0171	0.0221	0.103	0.194	0.364**	0.0937
	(0.0221)	(0.0336)	(0.0203)	(0.0433)	(0.0137)	(0.0199)	(0.0159)	(0.0229)	(0.147)	(0.245)	(0.179)	(0.279)
Log [Child family labor (days)/ha]	-0.000793	-0.00268	-0.00184	0.000857	6.42e-05	-0.00250	-0.00375	0.000135	-0.0163	-0.0210	-0.0301	-0.0315
	(0.00200)	(0.00604)	(0.00413)	(0.00287)	(0.00419)	(0.00477)	(0.00563)	(0.00776)	(0.0326)	(0.0391)	(0.0440)	(0.0620)
Log [Hired male labor (days)/ha]	0.0382***	0.0188*	0.0259**	0.0357*	0.000584	-0.00120	-0.000620	0.0112	-0.0354	-0.0366	-0.0255	-0.00151
	(0.0144)	(0.0110)	(0.0107)	(0.0182)	(0.00496)	(0.00511)	(0.00557)	(0.0107)	(0.0402)	(0.0479)	(0.0483)	(0.0927)
Log [Hired female labor (days)/ha]	-0.00151	-0.00156	-0.000933	-0.00199	-0.00446	-0.00356	-0.00145	-0.00209	0.00353	-0.0139	0.00485	-0.0196
	(0.00375)	(0.00398)	(0.00246)	(0.00526)	(0.00366)	(0.00381)	(0.00446)	(0.00807)	(0.0360)	(0.0459)	(0.0470)	(0.0757)
Log [Hired children labor (days)/ha]	0.000156	0.000112	-0.000413	0.000775	-0.00169	6.82e-05	-0.00114	0.00111	-0.00231	0.00559	-0.00499	0.00578
	(0.00170)	(0.00125)	(0.00448)	(0.00839)	(0.00147)	(0.00111)	(0.00117)	(0.00142)	(0.0111)	(0.00982)	(0.0106)	(0.0105)
Constant					0.192**	0.151	0.175	-0.0475	1.499*	0.759	1.472	-0.895
					(0.0823)	(0.133)	(0.116)	(0.129)	(0.829)	(1.396)	(1.045)	(1.056)
Observations							**2.050**					

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable

Table 11

RIF estimates South (excluding the west)

	mean	*10th Percentile*	*20th Percentile*	*30th Percentile*	*40th Percentile*	*50th Percentile*	*60th Percentile*	*70th Percentile*	*80th Percentile*	*90th Percentile*
A. Gender Differential										
Male Managed plot	12.53***	10.23***	11.05***	11.68***	12.28***	12.73***	13.08***	13.46***	13.89***	14.75***
	(0.0802)	(0.236)	(0.122)	(0.166)	(0.0971)	(0.0682)	(0.0672)	(0.0601)	(0.112)	(0.172)
Female managed plot	12.29***	9.842***	10.85***	11.52***	11.99***	12.54***	12.94***	13.30***	13.77***	14.59***
	(0.0963)	(0.211)	(0.193)	(0.108)	(0.0993)	(0.117)	(0.0918)	(0.0628)	(0.0932)	(0.121)
Gender Differential	0.239*	0.384	0.199	0.159	0.286**	0.193	0.133	0.160*	0.124	0.167
	(0.125)	(0.316)	(0.228)	(0.198)	(0.139)	(0.136)	(0.114)	(0.0869)	(0.146)	(0.210)
B. Aggregate Decomposition										
Endowment Effect	0.287***	0.921***	0.751***	0.914***	0.417***	0.278**	0.199**	0.0953	0.131	0.0814
	(0.111)	(0.295)	(0.186)	(0.181)	(0.121)	(0.109)	(0.0932)	(0.0724)	(0.127)	(0.173)
Share of the Gender Differential	120%	240%	377%	575%	146%	144%	150%	59%	106%	49%
Male Structural Advantage	-0	-0	-0	-0	0	-0	-0	0	-0	-0
	(0.0144)	(0.0407)	(0.0327)	(0.0340)	(0.0193)	(0.0244)	(0.0171)	(0.0108)	(0.0214)	(0.0270)
Share of the Gender Differential	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Female Structural Advantage	-0.0484	-0.537	-0.552**	-0.756***	-0.131	-0.0850	-0.0655	0.0648	-0.00706	0.0860
	(0.130)	(0.411)	(0.253)	(0.224)	(0.149)	(0.145)	(0.121)	(0.0927)	(0.158)	(0.238)
Share of the Gender Differential	-20%	-140%	-277%	-475%	-46%	-44%	-50%	41%	-6%	51%
Observations						**945**				

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable

Table 12: Detailed RIF estimates South ((excluding the west)

A. Gender Differential	***mean***	***10th Percentile***	***50th Percentile***	***90th Percentile***
Male Managed plot	12.53***	10.23***	12.73***	14.75***
	(0.0802)	(0.236)	(0.0682)	(0.172)
Female managed plot	12.29***	9.842***	12.54***	14.59***
	(0.0963)	(0.211)	(0.117)	(0.121)
Gender Differential	0.239*	0.384	0.193	0.167
	(0.125)	(0.316)	(0.136)	(0.210)

B. Aggregate Decomposition	*Endowment Effect*				*Male Structural Advantage*				*Female Structural Disadvantage*			
	mean	*10th*	*50th*	*90th*	*mean*	*10th*	*50th*	*90th*	*mean*	*10th*	*50th*	*90th*
Total	0.287***	0.921***	0.278**	0.0814	-0	0	-0	-0	-0.0484	-0.537	-0.0850	0.0860
	(0.111)	(0.295)	(0.109)	(0.173)	(0.0144)	(0.0407)	(0.0244)	(0.0270)	(0.130)	(0.411)	(0.145)	(0.238)
Share of the Gender Differential	120%	240%	144%	49%	0%	0%	0%	0%	-20%	-140%	-44%	52%
C. Detailed Decomposition	*Endowment Effect*				*Male Structural Advantage*				*Female Structural Disadvantage*			
	mean	*10th*	*50th*	*90th*	*mean*	*10th*	*50th*	*90th*	*mean*	*10th*	*50th*	*90th*
Age	0.0148	-0.00716	-0.0519	0.216	-0.480	-0.813	1.710	-0.140	-2.037	-2.313	0.941	-1.535
	(0.0366)	(0.115)	(0.0509)	(0.134)	(1.034)	(2.941)	(1.255)	(1.994)	(1.453)	(4.143)	(1.853)	(2.285)
Age Squared	-0.0160	0.00399	0.0600	-0.233*	0.510	0.675	-0.798	0.228	1.424*	1.262	-0.432	1.216
	(0.0386)	(0.121)	(0.0540)	(0.137)	(0.534)	(1.507)	(0.648)	(1.068)	(0.764)	(2.194)	(0.984)	(1.215)
Years of schooling	0.00647	0.0201	0.0288	0.0146	-0.102*	-0.130	-0.240***	0.188	-0.0793	-0.320	-0.192*	0.116
	(0.0219)	(0.0653)	(0.0253)	(0.0508)	(0.0591)	(0.176)	(0.0733)	(0.133)	(0.0762)	(0.211)	(0.0999)	(0.158)
Manager is nonmuslim†	0.0104	0.0593**	0.00614	-0.0214*	0.130	-0.0200	0.293	0.0101	-0.380	-2.172**	-0.225	0.784*
	(0.00955)	(0.0300)	(0.00860)	(0.0128)	(0.157)	(0.331)	(0.185)	(0.255)	(0.336)	(0.950)	(0.309)	(0.425)
Manager has nonfarm activity†	0.00134	0.00378	0.00244	-0.00254	-1.21e-06	0.0314	-0.0291	-0.0600	-0.00301	0.0963	-0.0148	-0.118
	(0.00392)	(0.0110)	(0.00690)	(0.00752)	(0.0309)	(0.0879)	(0.0358)	(0.0614)	(0.0390)	(0.102)	(0.0480)	(0.0809)
Household female adult size (age 12-60)	-0.0249*	-0.0375	-1.44e-05	-0.0603**	-0.0236	-0.0318	-0.0777	0.0130	0.0536	0.243	-0.0413	0.0634
	(0.0131)	(0.0329)	(0.0113)	(0.0287)	(0.0692)	(0.195)	(0.0816)	(0.141)	(0.0854)	(0.264)	(0.104)	(0.145)
Household male adult size (age 12-60)	0.0189	0.0455	0.00529	0.0272	0.0790	0.389**	0.0333	0.222	0.114	0.400*	0.0956	0.229*
	(0.0125)	(0.0362)	(0.0131)	(0.0247)	(0.0626)	(0.188)	(0.0755)	(0.136)	(0.0726)	(0.208)	(0.0880)	(0.137)
Child dependency ratio	-0.00365	0.00530	-0.00320	0.0119	0.0924*	0.326**	0.0405	0.0378	0.0724	0.420***	0.0138	0.0813
	(0.00880)	(0.0254)	(0.00850)	(0.0161)	(0.0526)	(0.157)	(0.0511)	(0.0903)	(0.0565)	(0.154)	(0.0604)	(0.0880)
Log [GPS-Land Area (HA)]	-0.215***	-0.788***	-0.134***	-0.0223	0.141	0.464	0.322	0.255	-0.225	0.115	-0.292	0.525
	(0.0742)	(0.270)	(0.0488)	(0.0436)	(0.310)	(1.073)	(0.214)	(0.357)	(0.508)	(1.618)	(0.356)	(0.514)
Log [GPS-Land Area (HA) Squared]	0.0268	0.428**	-0.0162	-0.152**	-0.148	-0.410	-0.319**	0.0792	-0.00854	-0.276	-0.150	0.205
	(0.0321)	(0.179)	(0.0265)	(0.0716)	(0.183)	(0.609)	(0.147)	(0.272)	(0.322)	(0.978)	(0.269)	(0.450)
Plot distance to household	0.00293	0.00453	0.00359	0.00502	-0.00120	0.00623	0.00166	0.00880	-0.00272	-0.000103	-0.000339	0.00609
	(0.00333)	(0.00497)	(0.00360)	(0.0115)	(0.00298)	(0.00778)	(0.00289)	(0.0143)	(0.00291)	(0.00392)	(0.00219)	(0.0107)
Access to extension†	0.00875	0.0300	0.0129	-0.00734	-0.00121	0.0172	0.00493	-0.0263	-0.000208	0.0211	0.00657	-0.0197
	(0.00758)	(0.0257)	(0.00913)	(0.0148)	(0.00800)	(0.0281)	(0.00968)	(0.0196)	(0.0114)	(0.0350)	(0.0117)	(0.0258)

Table 12 (Cont'd)

C. Detailed Decomposition	*Endowment Effect*				*Male Structural Advantage*				*Female Structural Disadvantage*			
	mean	*10th*	*50th*	*90th*	*mean*	*10th*	*50th*	*90th*	*mean*	*10th*	*50th*	*90th*
Grows cash crop†	-0.000211	0.00203	-0.000201	-0.000483	-0.00132	-0.0243	-0.0189	-0.000103	-0.0104	-0.0658	-0.0277	0.00209
	(0.00166)	(0.00682)	(0.00172)	(0.00336)	(0.0166)	(0.0509)	(0.0191)	(0.0314)	(0.0214)	(0.0641)	(0.0240)	(0.0388)
Only one crop on plot†	-0.0193	-0.0137	-0.0214	-0.0119	0.0119	0.0478	0.0275	0.00777	0.00573	0.0253	0.0146	0.0127
	(0.0160)	(0.0171)	(0.0177)	(0.0131)	(0.0199)	(0.0545)	(0.0239)	(0.0400)	(0.0305)	(0.0849)	(0.0354)	(0.0552)
Log [Qty of fertilizer (kg)/ha]	-4.88e-05	-6.10e-05	-3.64e-05	-9.11e-05	-0.0391	-0.0971	-0.0966***	0.0903	-0.0339	-0.0976	-0.125**	0.158
	(0.0164)	(0.0205)	(0.0122)	(0.0306)	(0.0295)	(0.0772)	(0.0341)	(0.0705)	(0.0481)	(0.116)	(0.0557)	(0.105)
Log [Herbicide (kg)/ha]	0.0310**	0.0769**	0.0294*	-0.00963	-0.00129	0.0338	0.00640	-0.0232	-0.000517	0.0174	-0.00809	-0.00961
	(0.0150)	(0.0384)	(0.0151)	(0.0208)	(0.0111)	(0.0319)	(0.0140)	(0.0252)	(0.00805)	(0.0201)	(0.00995)	(0.0180)
Log [Pesticide (kg)/ha]	-0.00356	-0.00364	-0.00442	0.000761	-0.00856	-0.0383	-0.0234*	0.0218	-0.00649	-0.0390	-0.0231	0.0363
	(0.00727)	(0.00850)	(0.00900)	(0.00500)	(0.00997)	(0.0250)	(0.0138)	(0.0219)	(0.0112)	(0.0270)	(0.0153)	(0.0259)
Used purchased seed†	0.00171	0.00662	0.00397	-0.00244	-0.0350	-0.0834	-0.0767	0.0431	-0.0254	-0.0824	-0.0981	0.134
	(0.00357)	(0.0118)	(0.00585)	(0.00688)	(0.0519)	(0.154)	(0.0602)	(0.101)	(0.0710)	(0.193)	(0.0830)	(0.141)
Log [Ag capital/ha (x1000 Naira)]	-0.00111	-0.00316	-0.000938	2.62e-05	-0.0986	0.210	-0.482***	-0.158	0.0248	0.448	-0.268	-0.381
	(0.00974)	(0.0278)	(0.00827)	(0.00117)	(0.179)	(0.526)	(0.186)	(0.319)	(0.199)	(0.522)	(0.215)	(0.337)
Log [Male family labor (days)/ha]	0.142***	0.465***	0.101*	0.122	0.162	0.429	0.169	-0.124	0.0662	0.177	0.0402	0.00407
	(0.0503)	(0.146)	(0.0553)	(0.0958)	(0.101)	(0.316)	(0.113)	(0.205)	(0.0450)	(0.126)	(0.0521)	(0.0823)
Log [Female family labor (days)/ha]	0.00940	0.0134	0.0200	0.0180	-0.0962	-0.227	-0.00574	0.0997	-0.0407	-0.154	0.147	-0.0100
	(0.0154)	(0.0410)	(0.0177)	(0.0333)	(0.0783)	(0.224)	(0.0910)	(0.182)	(0.107)	(0.297)	(0.125)	(0.214)
Log [Child family labor (days)/ha]	0.000458	0.00253	-0.000499	-0.00190	-0.0147	-0.0339	-0.0270	-0.0111	-0.0228	-0.0300	-0.0211	-0.0286
	(0.00163)	(0.00669)	(0.00209)	(0.00487)	(0.0125)	(0.0382)	(0.0181)	(0.0266)	(0.0169)	(0.0464)	(0.0227)	(0.0319)
Log [Hired male labor (days)/ha]	0.0102	0.00253	0.00558	-0.0115	0.0272	0.0693	0.0227	-0.0266	0.0153	0.0592	0.0125	-0.0435
	(0.00916)	(0.0191)	(0.00895)	(0.0190)	(0.0212)	(0.0528)	(0.0244)	(0.0483)	(0.0230)	(0.0562)	(0.0262)	(0.0430)
Log [Hired female labor (days)/ha]	8.31e-05	-0.0146	-0.00162	0.00803	-0.0167	-0.0408	-0.00324	-0.0325	-0.0104	-0.00933	-0.00585	-0.0337
	(0.00505)	(0.0159)	(0.00556)	(0.0132)	(0.0132)	(0.0293)	(0.0155)	(0.0319)	(0.0146)	(0.0312)	(0.0184)	(0.0319)
Log [Hired children labor (days)/ha]	0.00898	0.0221	0.0180	0.000464	0	0	0	0	-0.00299	-0.00761	-0.00516	0.00850
	(0.0108)	(0.0400)	(0.0114)	(0.00581)	(0)	(0)	(0)	(0)	(0.00335)	(0.00836)	(0.00568)	(0.00747)
Constant					-0.238	-0.963	-0.304	-1.484	1.031	1.849	0.677	-1.812
					(0.583)	(1.710)	(0.717)	(1.029)	(0.812)	(2.513)	(1.057)	(1.296)
Observations							**945**					

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable

Table 13: Exploring the Presence of Omitted Variable Bias in Base OLS Regression Results Underlying the Mean Decomposition North, Pooled
Category of Additional Covariates Integrated to the Base Regression

VARIABLES	*Base North*	*Manager characteristics*	*Plot characteristics*	*Geospatial characteristics*	*Crop fixed effects*	*Community characteristics*
Female manager=1	-0.274***	-0.343**	-0.277***	-0.192*	-0.243**	-0.212*
	(0.103)	(0.163)	(0.103)	(0.0999)	(0.0993)	(0.112)
Age	-0.00647	-0.0266*	-0.00740	-0.0138	-0.0149	-0.00299
	(0.0130)	(0.0151)	(0.0131)	(0.0140)	(0.0122)	(0.0130)
Age Squared	3.90e-05	0.000220	4.75e-05	0.000112	0.000116	-1.28e-05
	(0.000128)	(0.000149)	(0.000128)	(0.000137)	(0.000117)	(0.000129)
Years of schooling	-0.00859	-0.00840	-0.00889	-0.00824	-0.00175	-0.00813
	(0.00586)	(0.00593)	(0.00590)	(0.00617)	(0.00571)	(0.00624)
Manager is nonmuslim†	-0.0320	-0.0244	-0.0281	-0.0484	-0.110	-0.0101
	(0.0903)	(0.0915)	(0.0892)	(0.111)	(0.0872)	(0.0910)
Manager has nonfarm activity†	-0.0570	-0.0781	-0.0578	-0.109*	-0.0439	-0.0332
	(0.0578)	(0.0585)	(0.0577)	(0.0632)	(0.0554)	(0.0612)
Household female adult size (age 12-60)	0.0367*	0.0436	0.0366	0.0446*	0.0281	0.0245
	(0.0221)	(0.0397)	(0.0223)	(0.0246)	(0.0209)	(0.0229)
Household male adult size (age 12-60)	0.0677***	0.0810*	0.0671***	0.0571**	0.0738***	0.0453*
	(0.0227)	(0.0431)	(0.0227)	(0.0245)	(0.0218)	(0.0240)
Child dependency ratio	-0.00260	0.0199	-0.00102	0.0107	0.00731	0.00470
	(0.0393)	(0.0534)	(0.0393)	(0.0421)	(0.0387)	(0.0430)
Log [GPS-Land Area (HA)]	-0.711***	-0.716***	-0.712***	-0.698***	-0.732***	-0.676***
	(0.0414)	(0.0416)	(0.0414)	(0.0440)	(0.0389)	(0.0466)
Log [GPS-Land Area (HA) Squared]	-0.0452***	-0.0465***	-0.0454***	-0.0427***	-0.0476***	-0.0587***
	(0.0149)	(0.0148)	(0.0150)	(0.0157)	(0.0146)	(0.0172)
Plot distance to household	0.000268	0.000262	0.000272	0.000371**	0.000227	0.000605**
	(0.000229)	(0.000228)	(0.000233)	(0.000160)	(0.000297)	(0.000306)
Access to extension†	0.124	0.127	0.114	0.0940	0.149*	0.113
	(0.0891)	(0.0892)	(0.0872)	(0.102)	(0.0894)	(0.0817)
Grows cash crop†	0.0944	0.0897	0.0932	0.0462	0.860*	0.111
	(0.0696)	(0.0711)	(0.0700)	(0.0758)	(0.471)	(0.0743)
Only one crop on plot †	-0.454***	-0.454***	-0.451***	-0.488***	-0.0455	-0.451***
	(0.0615)	(0.0621)	(0.0607)	(0.0647)	(0.0670)	(0.0650)

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable

Table 13 (Cont'd)

VARIABLES						
Log [Qty of fertilizer (kg)/ha]	0.0532***	0.0553***	0.0521***	0.0559***	0.0339***	0.0593***
	(0.0113)	(0.0115)	(0.0113)	(0.0127)	(0.0112)	(0.0114)
Log [Herbicide (kg)/ha]	0.0449	0.0386	0.0439	0.0511	0.0448	0.0320
	(0.0290)	(0.0286)	(0.0291)	(0.0326)	(0.0297)	(0.0258)
Log [Pesticide (kg)/ha]	-0.0546	-0.0536	-0.0565	-0.0512	-0.0505	-0.0539
	(0.0393)	(0.0395)	(0.0397)	(0.0470)	(0.0380)	(0.0434)
Used purchased seed†	-0.120*	-0.130**	-0.124**	-0.0913	-0.156***	-0.0872
	(0.0616)	(0.0630)	(0.0618)	(0.0665)	(0.0600)	(0.0612)
Log [Ag capital/ha (x1000 Naira)]	0.0663***	0.0671***	0.0658***	0.0589***	0.0742***	0.0810***
	(0.0202)	(0.0205)	(0.0201)	(0.0221)	(0.0198)	(0.0211)
Log [Male family labor (days)/ha]	-0.000138	-0.00616	-5.51e-05	0.00981	-0.0125	0.00624
	(0.0166)	(0.0172)	(0.0166)	(0.0177)	(0.0155)	(0.0179)
Log [Female family labor (days)/ha]	-0.000242	0.00242	-0.000404	0.00918	0.00403	-0.00210
	(0.0166)	(0.0171)	(0.0166)	(0.0183)	(0.0159)	(0.0180)
Log [Child family labor (days)/ha]	0.0117	0.0129	0.0122	0.0115	0.00835	0.0165
	(0.0151)	(0.0157)	(0.0151)	(0.0157)	(0.0142)	(0.0164)
Log [Hired male labor (days)/ha]	0.114***	0.118***	0.114***	0.110***	0.0971***	0.109***
	(0.0203)	(0.0204)	(0.0204)	(0.0227)	(0.0197)	(0.0204)
Log [Hired female labor (days)/ha]	0.0337	0.0270	0.0342	0.0389	0.0392*	0.0445*
	(0.0241)	(0.0244)	(0.0243)	(0.0286)	(0.0237)	(0.0252)
Log [Hired children labor (days)/ha]	-0.0390	-0.0341	-0.0359	-0.0431	-0.00168	-0.0243
	(0.0514)	(0.0524)	(0.0517)	(0.0584)	(0.0504)	(0.0534)
Constant	10.54***	10.77***	10.72***	20.67***	10.02***	10.70***
	(0.332)	(0.426)	(0.379)	(2.044)	(0.324)	(0.328)
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,050	2,018	2,050	1,817	2,050	1,733
R-squared	0.405	0.408	0.405	0.411	0.478	0.429

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable

Table 14: Exploring the Presence of Omitted Variable Bias in Base OLS Regression Results Underlying the Mean Decomposition North, Female

	Category of Additional Covariates Integrated to the Base Regression					
VARIABLES	*Base North*	*Manager characteristics*	*Plot characteristics*	*Geospatial characteristics*	*Crop fixed effects*	*Community characteristics*
Female manager=1						
Age	0.0728**	0.0317	0.0778**	0.0822**	0.0727*	0.0613
	(0.0357)	(0.0396)	(0.0381)	(0.0405)	(0.0410)	(0.0378)
Age Squared	-0.000879**	-0.000471	-0.000918**	-0.000920**	-0.000911**	-0.000747*
	(0.000381)	(0.000416)	(0.000403)	(0.000427)	(0.000412)	(0.000394)
Years of schooling	-0.0122	-0.00985	-0.00226	-0.00510	0.00789	-0.00543
	(0.0291)	(0.0329)	(0.0304)	(0.0312)	(0.0353)	(0.0338)
Manager is nonmuslim†	-0.487*	-0.565*	-0.532*	-0.656**	-0.531*	-0.535*
	(0.278)	(0.314)	(0.279)	(0.309)	(0.292)	(0.283)
Manager has nonfarm activity†	0.343	0.243	0.366	-0.00115	0.348	0.315
	(0.262)	(0.317)	(0.266)	(0.228)	(0.288)	(0.291)
Household female adult size (age 12-60)	-0.178	-0.112	-0.169	-0.207*	-0.0879	-0.240*
	(0.108)	(0.175)	(0.108)	(0.111)	(0.117)	(0.126)
Household male adult size (age 12-60)	0.0463	0.186	0.0493	0.0840	0.0206	0.00493
	(0.0933)	(0.152)	(0.0933)	(0.0937)	(0.101)	(0.135)
Child dependency ratio	0.0187	0.209	0.0165	0.0237	0.00515	0.164
	(0.130)	(0.233)	(0.130)	(0.123)	(0.138)	(0.154)
Log [GPS-Land Area (HA)]	-0.723***	-0.687***	-0.716***	-0.625***	-0.735***	-0.637**
	(0.185)	(0.199)	(0.183)	(0.137)	(0.196)	(0.271)
Log [GPS-Land Area (HA) Squared]	-0.0251	-0.0129	-0.0234	0.0315	-0.00796	-0.0442
	(0.0565)	(0.0582)	(0.0558)	(0.0391)	(0.0571)	(0.0778)
Plot distance to household	0.00996	0.00546	0.00872	0.00569	0.0135*	0.0277
	(0.00862)	(0.01000)	(0.00880)	(0.00805)	(0.00761)	(0.0190)
Access to extension†	0.178	0.0658	0.216	0.171	0.291	0.354
	(0.320)	(0.346)	(0.327)	(0.337)	(0.342)	(0.369)
Grows cash crop†	0.574**	0.585*	0.625**	0.577*	1.318**	0.500*
	(0.280)	(0.325)	(0.289)	(0.300)	(0.584)	(0.264)
Only one crop on plot †	-0.161	-0.136	-0.197	-0.0589	0.203	-0.278
	(0.198)	(0.215)	(0.205)	(0.194)	(0.256)	(0.230)

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable

Table 14 (Cont'd)

VARIABLES						
Log [Qty of fertilizer (kg)/ha]	0.0486	0.0392	0.0525	0.0117	0.0357	0.0335
	(0.0445)	(0.0453)	(0.0458)	(0.0435)	(0.0527)	(0.0466)
Log [Herbicide (kg)/ha]	0.129	0.187**	0.116	0.129	0.0528	0.172*
	(0.0872)	(0.0914)	(0.0901)	(0.0778)	(0.0977)	(0.101)
Log [Pesticide (kg)/ha]	0.00982	-0.164	0.00263	0.00669	0.0584	-0.00311
	(0.106)	(0.125)	(0.110)	(0.0947)	(0.119)	(0.112)
Used purchased seed†	0.210	0.187	0.314	0.221	0.133	0.164
	(0.209)	(0.242)	(0.232)	(0.226)	(0.233)	(0.239)
Log [Ag capital/ha (x1000 Naira)]	0.136*	0.140*	0.141*	0.0480	0.0979	0.212**
	(0.0779)	(0.0820)	(0.0792)	(0.0765)	(0.0843)	(0.0988)
Log [Male family labor (days)/ha]	0.0114	0.0212	0.0128	-0.00898	0.0168	0.0698
	(0.0374)	(0.0450)	(0.0374)	(0.0362)	(0.0398)	(0.0425)
Log [Female family labor (days)/ha]	-0.0298	-0.0274	-0.0236	-0.0290	-0.0547	-0.0522
	(0.0480)	(0.0534)	(0.0491)	(0.0483)	(0.0482)	(0.0552)
Log [Child family labor (days)/ha]	0.0298	0.0349	0.0316	0.0532	0.0235	0.0652
	(0.0404)	(0.0440)	(0.0416)	(0.0360)	(0.0403)	(0.0488)
Log [Hired male labor (days)/ha]	0.175**	0.223**	0.187**	0.149*	0.110	0.207**
	(0.0773)	(0.0861)	(0.0807)	(0.0876)	(0.0848)	(0.0853)
Log [Hired female labor (days)/ha]	0.0265	0.0406	0.0172	0.0471	0.0371	-0.0151
	(0.0829)	(0.0862)	(0.0861)	(0.0799)	(0.0870)	(0.0969)
Log [Hired children labor (days)/ha]	-0.00687	0.0393	-0.0264	0.0116	0.0385	0.0363
	(0.178)	(0.185)	(0.183)	(0.137)	(0.180)	(0.173)
Constant	9.038***	10.08***	8.324***	30.46***	8.420***	9.326***
	(0.893)	(1.009)	(1.044)	(6.546)	(1.057)	(1.031)
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	195	189	195	182	195	158
R-squared	0.583	0.612	0.588	0.597	0.653	0.625

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable

Table 15: Exploring the Presence of Omitted Variable Bias in Base OLS Regression Results Underlying the Mean Decomposition North, Male

Category of Additional Covariates Integrated to the Base Regression

VARIABLES	Base North	Manager characteristics	Plot characteristics	Geospatial characteristics	Crop fixed effects	Community characteristics
Female manager=1						
Age	-0.0148	-0.0402**	-0.0159	-0.0229	-0.0245*	-0.00798
	(0.0142)	(0.0168)	(0.0142)	(0.0152)	(0.0133)	(0.0141)
Age Squared	0.000124	0.000369**	0.000134	0.000192	0.000216*	3.97e-05
	(0.000137)	(0.000164)	(0.000137)	(0.000148)	(0.000125)	(0.000138)
Years of schooling	-0.00735	-0.00683	-0.00767	-0.00816	-0.00115	-0.00708
	(0.00601)	(0.00613)	(0.00604)	(0.00634)	(0.00585)	(0.00638)
Manager is nonmuslim†	-0.00958	0.00230	-0.00484	-0.0164	-0.0928	-2.88e-05
	(0.0955)	(0.0966)	(0.0943)	(0.119)	(0.0920)	(0.0960)
Manager has nonfarm activity†	-0.0848	-0.101	-0.0852	-0.133**	-0.0707	-0.0539
	(0.0604)	(0.0615)	(0.0602)	(0.0669)	(0.0575)	(0.0634)
Household female adult size (age 12-60)	0.0384*	0.0547	0.0392*	0.0555**	0.0262	0.0251
	(0.0227)	(0.0434)	(0.0227)	(0.0253)	(0.0216)	(0.0234)
Household male adult size (age 12-60)	0.0679***	0.0940**	0.0663***	0.0561**	0.0737***	0.0447*
	(0.0245)	(0.0471)	(0.0246)	(0.0265)	(0.0235)	(0.0257)
Child dependency ratio	-0.00448	0.0144	-0.00270	0.0136	0.00850	-0.0116
	(0.0421)	(0.0552)	(0.0421)	(0.0456)	(0.0414)	(0.0445)
Log [GPS-Land Area (HA)]	-0.704***	-0.711***	-0.706***	-0.696***	-0.728***	-0.673***
	(0.0425)	(0.0422)	(0.0425)	(0.0471)	(0.0398)	(0.0473)
Log [GPS-Land Area (HA) Squared]	-0.0517***	-0.0529***	-0.0518***	-0.0529***	-0.0549***	-0.0638***
	(0.0160)	(0.0158)	(0.0161)	(0.0173)	(0.0156)	(0.0183)
Plot distance to household	0.000304	0.000293	0.000309	0.000384**	0.000266	0.000611*
	(0.000227)	(0.000223)	(0.000231)	(0.000166)	(0.000300)	(0.000315)
Access to extension†	0.131	0.154	0.120	0.0979	0.145	0.117
	(0.0950)	(0.0942)	(0.0930)	(0.109)	(0.0967)	(0.0861)
Grows cash crop†	0.0559	0.0600	0.0546	0.0211	0.394	0.0661
	(0.0728)	(0.0742)	(0.0733)	(0.0788)	(0.471)	(0.0791)
Only one crop on plot †	-0.472***	-0.464***	-0.469***	-0.528***	-0.0657	-0.451***
	(0.0647)	(0.0653)	(0.0640)	(0.0692)	(0.0700)	(0.0681)

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable

Table 15 (Cont'd)

VARIABLES						
Log [Qty of fertilizer (kg)/ha]	0.0531***	0.0567***	0.0520***	0.0579***	0.0324***	0.0595***
	(0.0118)	(0.0121)	(0.0119)	(0.0135)	(0.0117)	(0.0120)
Log [Herbicide (kg)/ha]	0.0396	0.0357	0.0374	0.0428	0.0466	0.0189
	(0.0310)	(0.0299)	(0.0311)	(0.0350)	(0.0316)	(0.0272)
Log [Pesticide (kg)/ha]	-0.0605	-0.0598	-0.0640	-0.0647	-0.0540	-0.0634
	(0.0407)	(0.0408)	(0.0413)	(0.0493)	(0.0396)	(0.0449)
Used purchased seed†	-0.138**	-0.151**	-0.140**	-0.107	-0.181***	-0.108*
	(0.0661)	(0.0679)	(0.0664)	(0.0718)	(0.0639)	(0.0653)
Log [Ag capital/ha (x1000 Naira)]	0.0676***	0.0674***	0.0670***	0.0668***	0.0747***	0.0788***
	(0.0212)	(0.0215)	(0.0210)	(0.0235)	(0.0208)	(0.0218)
Log [Male family labor (days)/ha]	-0.00296	-0.00652	-0.00317	0.0107	-0.0192	-0.00357
	(0.0190)	(0.0190)	(0.0190)	(0.0206)	(0.0179)	(0.0202)
Log [Female family labor (days)/ha]	0.00241	0.00371	0.00252	0.0142	0.00574	0.00409
	(0.0181)	(0.0183)	(0.0180)	(0.0202)	(0.0172)	(0.0194)
Log [Child family labor (days)/ha]	0.0118	0.0146	0.0126	0.00954	0.00882	0.0155
	(0.0163)	(0.0171)	(0.0163)	(0.0172)	(0.0153)	(0.0177)
Log [Hired male labor (days)/ha]	0.115***	0.116***	0.114***	0.109***	0.101***	0.110***
	(0.0209)	(0.0209)	(0.0209)	(0.0233)	(0.0204)	(0.0210)
Log [Hired female labor (days)/ha]	0.0237	0.0159	0.0239	0.0345	0.0316	0.0336
	(0.0256)	(0.0260)	(0.0259)	(0.0308)	(0.0254)	(0.0270)
Log [Hired children labor (days)/ha]	-0.0639	-0.0598	-0.0600	-0.0746	-0.0282	-0.0491
	(0.0520)	(0.0530)	(0.0523)	(0.0601)	(0.0512)	(0.0547)
Constant	10.73***	11.00***	10.96***	20.27***	10.28***	10.84***
	(0.358)	(0.486)	(0.406)	(2.199)	(0.346)	(0.353)
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,855	1,829	1,855	1,635	1,855	1,575
R-squared	0.397	0.402	0.399	0.407	0.474	0.421

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable

Table 16: Exploring the Presence of Omitted Variable Bias in Base OLS Regression Results Underlying the Mean Decomposition South, Pooled

Category of Additional Covariates Integrated to the Base Regression

VARIABLES	*Base South*	*Manager characteristics*	*Plot characteristics*	*Geospatial characteristics*	*Crop fixed effects*	*Community characteristics*
Female manager=1	0.0484	-0.0921	0.0479	0.0102	0.106	0.0388
	(0.132)	(0.201)	(0.132)	(0.133)	(0.128)	(0.138)
Age	0.00817	-0.00492	0.00756	0.0107	0.0138	0.0267
	(0.0201)	(0.0234)	(0.0202)	(0.0202)	(0.0191)	(0.0220)
Age Squared	-7.37e-05	0.000100	-7.37e-05	-9.80e-05	-0.000140	-0.000238
	(0.000177)	(0.000210)	(0.000178)	(0.000179)	(0.000167)	(0.000193)
Years of schooling	0.00339	0.000171	0.00380	0.00355	0.00246	0.00375
	(0.0117)	(0.0121)	(0.0117)	(0.0121)	(0.0104)	(0.0119)
Manager is nonmuslim†	-0.380	-0.201	-0.415	-0.258	-0.550*	-0.659*
	(0.342)	(0.353)	(0.343)	(0.335)	(0.329)	(0.343)
Manager has nonfarm activity†	0.125	0.128	0.126	0.0859	0.141	0.146
	(0.120)	(0.122)	(0.119)	(0.121)	(0.113)	(0.123)
Household female adult size (age 12-60)	-0.0962**	-0.133*	-0.0946**	-0.0907**	-0.0987***	-0.0930**
	(0.0384)	(0.0716)	(0.0389)	(0.0383)	(0.0367)	(0.0385)
Household male adult size (age 12-60)	0.0739*	0.0195	0.0717*	0.0753*	0.0724*	0.0482
	(0.0431)	(0.0677)	(0.0431)	(0.0433)	(0.0404)	(0.0416)
Child dependency ratio	-0.0449	-0.102	-0.0498	-0.0202	-0.0474	0.0261
	(0.108)	(0.163)	(0.107)	(0.109)	(0.101)	(0.113)
Log [GPS-Land Area (HA)]	-0.746***	-0.765***	-0.749***	-0.748***	-0.788***	-0.742***
	(0.139)	(0.141)	(0.138)	(0.140)	(0.144)	(0.145)
Log [GPS-Land Area (HA) Squared]	-0.0230	-0.0235	-0.0227	-0.0237	-0.0325	-0.0199
	(0.0269)	(0.0273)	(0.0266)	(0.0276)	(0.0274)	(0.0279)
Plot distance to household	0.000950	0.000911	0.000900	0.000989	0.00209***	0.000801
	(0.000661)	(0.000703)	(0.000625)	(0.000655)	(0.000653)	(0.000632)
Access to extension†	0.305	0.338	0.266	0.353	0.267	0.304
	(0.230)	(0.227)	(0.230)	(0.223)	(0.209)	(0.237)
Grows cash crop†	-0.0235	-0.0405	0.280	-0.0350	-0.534	0.0935
	(0.180)	(0.181)	(0.258)	(0.190)	(0.719)	(0.175)
Only one crop on plot †	-0.640***	-0.641***	-0.650***	-0.536***	0.175	-0.600***
	(0.141)	(0.145)	(0.142)	(0.145)	(0.170)	(0.147)

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable

Table 16 (Cont'd)

VARIABLES						
Log [Qty of fertilizer (kg)/ha]	0.0861***	0.0892***	0.0853***	0.0745***	0.0622***	0.0901***
	(0.0191)	(0.0195)	(0.0192)	(0.0195)	(0.0173)	(0.0194)
Log [Herbicide (kg)/ha]	0.241***	0.244***	0.246***	0.236***	0.265***	0.264***
	(0.0784)	(0.0759)	(0.0771)	(0.0845)	(0.0712)	(0.0768)
Log [Pesticide (kg)/ha]	-0.133*	-0.142*	-0.130*	-0.118	-0.104*	-0.112
	(0.0712)	(0.0722)	(0.0686)	(0.0720)	(0.0631)	(0.0688)
Used purchased seed†	0.0640	0.0761	0.0602	0.0953	-0.159	0.0221
	(0.110)	(0.113)	(0.110)	(0.111)	(0.103)	(0.110)
Log [Ag capital/ha (x1000 Naira)]	0.0841*	0.0748	0.0838*	0.0798	0.0725	0.109*
	(0.0497)	(0.0516)	(0.0492)	(0.0505)	(0.0454)	(0.0577)
Log [Male family labor (days)/ha]	0.0635***	0.0547**	0.0653***	0.0567**	0.0276	0.0595**
	(0.0224)	(0.0242)	(0.0223)	(0.0224)	(0.0214)	(0.0233)
Log [Female family labor (days)/ha]	-0.0137	-0.0122	-0.0151	-0.0159	-0.00583	-0.0186
	(0.0226)	(0.0235)	(0.0227)	(0.0227)	(0.0216)	(0.0235)
Log [Child family labor (days)/ha]	0.00882	0.00726	0.00656	0.0200	0.0142	0.0120
	(0.0262)	(0.0285)	(0.0264)	(0.0258)	(0.0250)	(0.0273)
Log [Hired male labor (days)/ha]	0.0598	0.0635	0.0583	0.0557	0.0247	0.0484
	(0.0464)	(0.0467)	(0.0464)	(0.0460)	(0.0438)	(0.0465)
Log [Hired female labor (days)/ha]	0.00112	0.00873	0.00554	0.0228	0.0163	0.0140
	(0.0693)	(0.0702)	(0.0686)	(0.0710)	(0.0599)	(0.0715)
Log [Hired children labor (days)/ha]	-0.322	-0.297	-0.313	-0.291	-0.316	-0.323
	(0.356)	(0.346)	(0.362)	(0.342)	(0.338)	(0.356)
Constant	9.461***	9.306***	9.861***	25.81***	8.796***	9.067***
	(0.669)	(0.815)	(0.724)	(5.997)	(0.643)	(0.700)
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	945	938	945	930	945	888
R-squared	0.386	0.391	0.39	0.387	0.529	0.415

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable

Table 17: Exploring the Presence of Omitted Variable Bias in Base OLS Regression Results Underlying the Mean Decomposition South, Female

		Category of Additional Covariates Integrated to the Base Regression				
VARIABLES	*Base South*	*Manager characteristics*	*Plot characteristics*	*Geospatial characteristics*	*Crop fixed effects*	*Community characteristics*
Female manager=1						
Age	0.0467	0.0747*	0.0408	0.0355	0.0205	0.0725
	(0.0376)	(0.0426)	(0.0379)	(0.0378)	(0.0364)	(0.0440)
Age Squared	-0.000549	-0.000720*	-0.000506	-0.000461	-0.000300	-0.000733*
	(0.000339)	(0.000389)	(0.000341)	(0.000348)	(0.000320)	(0.000386)
Years of schooling	0.0202	0.0220	0.0203	0.0131	0.0286	0.0245
	(0.0187)	(0.0201)	(0.0194)	(0.0200)	(0.0174)	(0.0197)
Manager is nonmuslim†						
Manager has nonfarm activity†	0.136	0.159	0.0884	0.128	-0.0130	0.125
	(0.192)	(0.199)	(0.190)	(0.193)	(0.184)	(0.202)
Household female adult size (age 12-60)	-0.127**	-0.0848	-0.134**	-0.104	-0.149**	-0.0888
	(0.0647)	(0.101)	(0.0641)	(0.0648)	(0.0640)	(0.0665)
Household male adult size (age 12-60)	-0.00777	0.0305	-0.0201	-0.0257	0.0184	0.0148
	(0.0652)	(0.108)	(0.0675)	(0.0647)	(0.0640)	(0.0624)
Child dependency ratio	-0.208	-0.177	-0.240	-0.214	-0.255	-0.0154
	(0.182)	(0.236)	(0.182)	(0.180)	(0.186)	(0.196)
Log [GPS-Land Area (HA)]	-0.828***	-0.820***	-0.841***	-0.829***	-0.925***	-0.737***
	(0.285)	(0.284)	(0.286)	(0.271)	(0.315)	(0.253)
Log [GPS-Land Area (HA) Squared]	-0.0220	-0.0159	-0.0273	-0.0234	-0.0416	-0.00469
	(0.0536)	(0.0542)	(0.0538)	(0.0529)	(0.0581)	(0.0495)
Plot distance to household	0.00190***	0.00198***	0.00196***	0.00192**	0.00150***	0.00145***
	(0.000505)	(0.000609)	(0.000560)	(0.000820)	(0.000464)	(0.000518)
Access to extension†	0.312	0.367	0.133	0.757	0.694	0.566
	(0.481)	(0.485)	(0.507)	(0.471)	(0.502)	(0.510)
Grows cash crop†	0.0821	0.0500	-0.0668	0.0140	0.715**	0.111
	(0.292)	(0.295)	(0.494)	(0.305)	(0.305)	(0.288)
Only one crop on plot †	-0.679**	-0.738**	-0.629**	-0.468*	-0.0725	-0.601*
	(0.281)	(0.294)	(0.281)	(0.266)	(0.295)	(0.319)

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable

Table 17 (Cont'd)

VARIABLES						
Log [Qty of fertilizer (kg)/ha]	0.104***	0.102***	0.0998***	0.0796**	0.0650**	0.103***
	(0.0328)	(0.0336)	(0.0332)	(0.0340)	(0.0287)	(0.0345)
Log [Herbicide (kg)/ha]	0.247**	0.254**	0.223**	0.275**	0.237***	0.266***
	(0.0995)	(0.103)	(0.0982)	(0.107)	(0.0838)	(0.0968)
Log [Pesticide (kg)/ha]	-0.0833	-0.0716	-0.0993	-0.108	-0.100	-0.0620
	(0.0928)	(0.102)	(0.103)	(0.0932)	(0.0777)	(0.0852)
Used purchased seed†	0.112	0.0796	0.136	0.151	-0.0703	0.0526
	(0.178)	(0.186)	(0.187)	(0.191)	(0.179)	(0.198)
Log [Ag capital/ha (x1000 Naira)]	0.0774	0.0708	0.0738	0.0685	0.0316	0.136*
	(0.0681)	(0.0746)	(0.0681)	(0.0678)	(0.0701)	(0.0795)
Log [Male family labor (days)/ha]	0.0278	0.0212	0.0312	0.0223	0.0217	0.0168
	(0.0330)	(0.0369)	(0.0330)	(0.0333)	(0.0317)	(0.0341)
Log [Female family labor (days)/ha]	-0.00405	0.00284	-0.00379	-0.0146	0.00268	0.00290
	(0.0343)	(0.0377)	(0.0350)	(0.0335)	(0.0328)	(0.0375)
Log [Child family labor (days)/ha]	0.0556	0.0608	0.0483	0.0596	0.0361	0.0487
	(0.0417)	(0.0474)	(0.0433)	(0.0407)	(0.0403)	(0.0450)
Log [Hired male labor (days)/ha]	0.0152	0.0144	0.0321	0.0159	-0.00285	-0.0231
	(0.0928)	(0.0950)	(0.0917)	(0.0916)	(0.0870)	(0.0948)
Log [Hired female labor (days)/ha]	0.0667	0.0687	0.0423	0.0668	0.0275	0.0586
	(0.125)	(0.122)	(0.127)	(0.128)	(0.0993)	(0.144)
Log [Hired children labor (days)/ha]	-0.215	-0.242	-0.211	-0.187	-0.254	-0.274
	(0.409)	(0.394)	(0.418)	(0.374)	(0.376)	(0.379)
Constant	8.430***	7.854***	9.413***	39.47**	8.593***	7.268***
	(1.058)	(1.282)	(1.199)	(16.12)	(1.079)	(1.207)
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	396	395	396	389	396	367
R-squared	0.386	0.395	0.394	0.393	0.541	0.439

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable

Table 18 Exploring the Presence of Omitted Variable Bias in Base OLS Regression Results Underlying the Mean Decomposition South, Male

Category of Additional Covariates Integrated to the Base Regression

VARIABLES	*Base South*	*Manager characteristics*	*Plot characteristics*	*Geospatial characteristics*	*Crop fixed effects*	*Community characteristics*
Female manager=1						
Age	-0.000624	-0.0318	0.00119	0.00252	0.0173	0.00878
	(0.0240)	(0.0320)	(0.0241)	(0.0246)	(0.0252)	(0.0261)
Age Squared	8.49e-05	0.000386	5.98e-05	6.32e-05	-0.000117	-8.65e-06
	(0.000210)	(0.000290)	(0.000210)	(0.000217)	(0.000226)	(0.000230)
Years of schooling	-0.0121	-0.00762	-0.00680	-0.00800	-0.0131	-0.0152
	(0.0155)	(0.0157)	(0.0152)	(0.0156)	(0.0146)	(0.0157)
Manager is nonmuslim†	-0.246	-0.0524	-0.191	-0.161	-0.426	-0.533
	(0.401)	(0.423)	(0.393)	(0.390)	(0.395)	(0.424)
Manager has nonfarm activity†	0.125	0.122	0.141	0.0873	0.204	0.171
	(0.157)	(0.163)	(0.157)	(0.163)	(0.154)	(0.160)
Household female adult size (age 12-60)	-0.108**	-0.219**	-0.112**	-0.0981*	-0.0985**	-0.102**
	(0.0521)	(0.108)	(0.0533)	(0.0517)	(0.0490)	(0.0519)
Household male adult size (age 12-60)	0.122**	0.00757	0.112*	0.128**	0.0955	0.0601
	(0.0603)	(0.0906)	(0.0608)	(0.0614)	(0.0585)	(0.0583)
Child dependency ratio	0.131	-0.0758	0.106	0.158	0.0856	0.159
	(0.131)	(0.246)	(0.129)	(0.134)	(0.121)	(0.138)
Log [GPS-Land Area (HA)]	-0.804***	-0.816***	-0.830***	-0.810***	-0.780***	-0.852***
	(0.140)	(0.138)	(0.132)	(0.155)	(0.137)	(0.168)
Log [GPS-Land Area (HA) Squared]	-0.0418	-0.0437	-0.0484*	-0.0448	-0.0399	-0.0459
	(0.0275)	(0.0265)	(0.0260)	(0.0303)	(0.0267)	(0.0313)
Plot distance to household	0.000748	0.000741	0.000768	0.000432	0.00310*	0.000372
	(0.000898)	(0.000968)	(0.000862)	(0.000818)	(0.00178)	(0.000890)
Access to extension†	0.284	0.296	0.274	0.210	0.220	0.237
	(0.280)	(0.289)	(0.282)	(0.275)	(0.253)	(0.285)
Grows cash crop†	-0.0357	-0.000977	0.442	0.0101	0.382	0.163
	(0.236)	(0.241)	(0.277)	(0.251)	(0.352)	(0.239)
Only one crop on plot †	-0.573***	-0.540***	-0.580***	-0.524***	0.317	-0.577***
	(0.163)	(0.176)	(0.166)	(0.172)	(0.221)	(0.169)

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable

Table 18 (Cont'd)

VARIABLES						
Log [Qty of fertilizer (kg)/ha]	0.0651***	0.0725***	0.0614**	0.0628**	0.0484**	0.0692***
	(0.0251)	(0.0264)	(0.0260)	(0.0255)	(0.0236)	(0.0248)
Log [Herbicide (kg)/ha]	0.235**	0.249**	0.235**	0.188	0.279***	0.253**
	(0.108)	(0.102)	(0.107)	(0.122)	(0.107)	(0.104)
Log [Pesticide (kg)/ha]	-0.187*	-0.215**	-0.167	-0.156	-0.106	-0.175*
	(0.105)	(0.103)	(0.102)	(0.112)	(0.0978)	(0.102)
Used purchased seed†	0.000556	0.0128	-0.00556	0.0104	-0.241*	-0.0619
	(0.145)	(0.152)	(0.143)	(0.144)	(0.137)	(0.144)
Log [Ag capital/ha (x1000 Naira)]	0.0572	0.0551	0.0670	0.0602	0.0884	0.0476
	(0.0771)	(0.0801)	(0.0747)	(0.0799)	(0.0710)	(0.0879)
Log [Male family labor (days)/ha]	0.103***	0.0949***	0.103***	0.0988***	0.0311	0.101***
	(0.0334)	(0.0361)	(0.0334)	(0.0338)	(0.0353)	(0.0343)
Log [Female family labor (days)/ha]	-0.0410	-0.0420	-0.0410	-0.0416	-0.0185	-0.0479
	(0.0303)	(0.0320)	(0.0305)	(0.0310)	(0.0310)	(0.0312)
Log [Child family labor (days)/ha]	-0.0184	-0.0240	-0.0254	-0.00597	-0.00555	-0.00423
	(0.0368)	(0.0396)	(0.0366)	(0.0355)	(0.0352)	(0.0381)
Log [Hired male labor (days)/ha]	0.113**	0.124**	0.0965*	0.112**	0.0475	0.100*
	(0.0519)	(0.0511)	(0.0529)	(0.0513)	(0.0518)	(0.0521)
Log [Hired female labor (days)/ha]	-0.0708	-0.0640	-0.0522	-0.0688	0.00436	-0.0317
	(0.0754)	(0.0781)	(0.0759)	(0.0794)	(0.0762)	(0.0766)
Log [Hired children labor (days)/ha]						
Constant	9.223***	9.413***	8.852***	17.22**	8.433***	9.227***
	(0.805)	(1.076)	(0.900)	(6.683)	(0.784)	(0.848)
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	549	543	549	541	549	521
R-squared	0.418	0.429	0.428	0.418	0.55	0.432

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. State fixed effects not displayed. † indicates dummy variable