

# Gendered Perceptions of Land Ownership and Agricultural Decision-making in Ecuador: Who Are the Farm Managers?

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**ABSTRACT.** *This paper challenges standard analyses of gender differences in agriculture, which typically focus on the sex of household heads or landholders, by considering who makes decisions on land owned by married women. We show that joint ownership and joint decision-making by couples is common in Ecuador but would be overlooked in studies focusing on only one farm manager. We also show that there are gender differences in perceptions about land ownership and agricultural decision-making, with men reporting lower levels of women's participation compared to their wives' report. Moreover, perceptions about the factors affecting women's participation in agricultural decision-making also differ.* (JEL D63, Q15)

## I. INTRODUCTION

Little is known about the relationship between land ownership and agricultural decision-making by gender largely because of the lack of appropriate individual-level data on these variables. At the core of the matter is the oversimplified view of farming systems and family structures that is embedded in household surveys and resultant studies of agricultural households.

Studies in economics that investigate how much say a woman has in the household have focused primarily on the decisions to allocate consumption expenditures or to distribute time across the home and the market (McElroy and Horney 1981; Browning et al. 1994; Lundberg, Pollack, and Wales 1997). These studies often do not focus on agricul-

tural households that are both production and consumption units, where these decisions are interrelated and where each adult member may provide input in the decision process. Analogously, studies of household decision-making based on nationally representative data sets such as the Demographic and Health Surveys do not cover agricultural decisions.

Agricultural surveys, such as the national agricultural censuses, tend to collect data about the farm from only one household member, the "landholder," defined as the principal person managing the farm.<sup>1</sup> Rarely are data collected on who owns the land, it being assumed that on owner-operated farms the principal farmer is the owner and that this person makes all the decisions regarding the

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<sup>1</sup> The FAO guidelines for the World Census of Agriculture (WCA) 2010 recognize that the concept of agricultural holder is too often conflated with that of the household head and introduce several innovations, such as the possibility for countries to recognize joint holders when husband and wife both manage the family farm or to delineate subholdings and subholders (FAO 2005). To date, no Latin American country that we know of has adopted these recommendations (observations by one of the authors at the FAO-Brazilian Ministry of Agricultural Development Workshop on Improving Agricultural Statistics for Gender Analysis, Caixas do Sul, Brazil, November 12, 2012).

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household's plots.<sup>2</sup> While most of the World Bank Living Standard Measurement Study (LSMS) surveys collect some data at the parcel level, these rarely ask who specifically in the household owns the plot (Doss, Grown, and Deere 2008). Moreover, information on farming practices in the LSMS surveys is gathered from only one person, the person who is considered to be the most knowledgeable or who reportedly makes the agricultural decisions, and at the farm, rather than at the plot, level. It is thus difficult to establish if the landowner is, in fact, the person who manages the land parcel and who makes the majority of decisions regarding agricultural production (Deere, Alvarado, and Twyman 2012). Further, existing data sets rarely take into account that a land parcel might be jointly owned by a couple, that agricultural management might involve more than one person in the household, or that decision-making might vary according to the specific activity.

In this paper we discuss why it is important when conducting agricultural analyses to consider that farms might be managed jointly by husbands and wives, and examine the relationship between women's land ownership and their participation in agricultural decision-making. We draw upon the 2010 Ecuador Household Asset Survey (EAFF by its Spanish acronym), a nationally representative survey that collected individual-level data on land ownership as well as parcel-level data on who in the household makes a series of agricultural decisions (EAFF 2010). We address the following questions: (1) how likely are female landowners to be engaged in agricultural decision-making on their own plots; (2) do husbands and wives share similar perceptions of women's land ownership and whether they participate in decisions; and (3) from the separate perspectives of husbands and wives, do similar factors explain whether women land-

owners participate in agricultural decision-making?

Ecuador provides a particularly good case for examining the relationship between land ownership and agricultural decision-making by gender, since property rights are well defined, the majority of agricultural parcels are formally titled, and it may be one of the few Latin American countries where there is not a gender bias in land ownership.<sup>3</sup> According to the EAFF (2010), women represent 53.6% of the landowners, their approximate share in the adult population (Deere and Contreras 2011, 33).<sup>4</sup> Moreover, previous work has found Ecuadorian households in general to be characterized by a relatively high degree of joint decision-making with regard to such decisions as employment outside the home and the use of income (Deere and Twyman 2012).

We show that the majority of Ecuadorian women landowners who are partnered (married or in a consensual union) are actively involved in the decisions regarding their land parcels, although there is some variation depending on the particular agricultural decision and on whether they own their parcel individually or jointly. Yet husbands and wives have different perceptions of women's participation; women tend to report higher levels of participation than do their husbands. Our regression analysis suggests that among the most important factors in whether women landowners participate in decision-making on their own plots—according to the perceptions of both men and women—is whether they actually work in their own fields.

## II. WHO ARE THE FARM MANAGERS?

A long-standing concern of those who advocate on behalf of gender equity in access to resources is that women's participation in agricultural production and decision-making often goes unrecognized and unreported. This is partly because in many developing countries men are considered the household's representative before the outside world, either because

<sup>2</sup> The WCA 2010 guidelines remain silent on the critically important issue of *who* in the household owns the land. These retain the traditional question on land tenure, asking whether the holding is characterized by legal ownership or other forms of tenure (FAO 2005). All one can deduce from such information is whether the agricultural holder works an owner-operated farm, broadly defined at the household level—not whether the agricultural holder him- or herself is the owner or joint owner of the farm.

<sup>3</sup> On the gender bias in land ownership in Latin America see Deere and León (2001, 2003).

<sup>4</sup> This estimate excludes agribusinesses, defined as those that employ five or more workers.

they are culturally so defined, or because they are so viewed by those intervening in the agricultural sector (Boserup 1970; Deere and León de Leal 1982; Dixon 1982; Kleysen and Campillo 1996). The implication of this is that in agricultural censuses or household surveys there is a bias toward indicating men as the landholders or primary agricultural decision-makers, irrespective of the amount of work or control that women have over agricultural production.

Most of the studies with an explicit gender focus end up carrying out their analysis utilizing the sex of the reported household head or of the landholder, assuming that only this one person is the farm manager who makes all of the decisions relevant to agricultural production. For example, while the recent Food and Agriculture Organization (FAO) *State of Food and Agriculture* report on women in agriculture recognizes that households may have multiple plot holders so that there are women land holders in male-headed households, the report fails to interrogate whether it can be assumed that each person makes all of the decisions regarding his or her plot alone. Nowhere in this otherwise worthy report is attention paid to how the myriad of decisions required to run a farm are made within households, and to the fact that more than one person may be involved in the decision-making process, irrespective of who is considered the head or the landholder of different plots (FAO 2011). A similar criticism can be made of the widely used *Gender in Agriculture Sourcebook* (World Bank, FAO, and IFAD 2009); no attention is given to the possibility of joint agricultural decision-making by husbands and wives.

In many ways, this is a surprising omission, since among the main issues of concern in the development field has been whether there are gender differentials in productivity or in the adoption of a new technology. To study such differences based on the sex of the household head makes little sense, since it ignores the fact that most women in rural contexts live and farm in households socially considered to be headed by men (Quisumbing 1996; Doss 2001). A headship analysis would thus ignore parcels worked by female landholders in male-headed households. Studies, such as that

of Udry (1996), that compare productivity by the sex of the landholder are more useful, although also potentially deficient, if the person who manages the parcel or keeps the revenues from crop sales does not make all of the key decisions alone, such as over what to plant or what inputs to use.

While there are relatively few studies that examine how decisions are actually made and by whom in the context of peasant agriculture, there is now a small but emerging literature, largely focused on Africa, critically examining whether the unit of analysis—headship versus landholder—makes a difference to the analysis of farming outcomes by gender (Doss 2002, 2014; Peterman, Quisumbing, and Behrman 2014). For example, Doss and Morris (2001) find in their study of 420 maize producers in Ghana that there is a significant difference for technology adoption: female heads are found less likely to adopt improved varieties of maize than male heads, in contrast to female landholders, whose adoption rates are no different at all from male landholders' adoption rates. Chirwa (2005) found similar results in his small-scale study in Malawi, where women represented 27% of the household heads. He defined the farmer as the person making most farming decisions, and by this definition women control 43% of the plots, since wives often farm their own plots in male-headed households. Controlling for access to resources and other characteristics, female heads are less likely to adopt inorganic fertilizer than male heads; when the same analysis is carried out based on the sex of the farmer, there are no significant gender differences in the adoption of inorganic fertilizer or improved seed.

Peterman et al. (2011) are highly critical of previous studies on productivity that take headship as the gender indicator for oversimplifying both complex family structures and the diverse multicrop farming systems in sub-Saharan Africa. They point out that the same crop may be grown by men and women independently in the same household as well as jointly by them. They carried out a sensitivity analysis of various potential indicators for gender—including headship, who claims ownership of the crops, the share of land managed by women, and household structure—

and found that none were consistently significant across regressions. They conclude that “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” (Peterman et al. 2011, 1500). In other words, it matters who is making specific decisions on each plot.

The recent LSMS-Integrated Surveys on Agriculture, such as that undertaken in Malawi, now distinguish between the plot manager (the person who makes the decision on what and when to plant and over input use) and the plot owner (Kilic, Palacios-Lopez, and Goldstein 2013). However, while the method of data collection allows plots that are jointly owned to be so recognized, only one manager can be reported per plot, limiting the potential contribution of being able to study the correspondence between management and ownership.

### The Evidence on Joint Decision-making

Beyond the discussion of the correct unit of analysis is the question of how agricultural decision-making processes occur within farm households. A number of case studies provide compelling evidence of joint decision-making in agriculture. Moreover, the more detailed studies show that participation in decision-making varies depending on the specific decision. Complicating matters further, which household member is reported to make a decision may vary according to the perceptions of the survey respondent.

Among the few studies from Africa that examine in a disaggregated manner who in the household makes the farm decisions is a study of decision-making among male- and female-headed households in Ethiopia, by Tiruneh et al. (2001). In their survey of 177 households in three districts, they find that a higher share of male-headed (30%) versus female-headed households (14%) utilize improved wheat varieties. When asked who made the decision to adopt the new varieties, 56% of the male heads report it was a joint decision, made with their wives, while only 44% report that they made the decision alone. Among the female-

headed households, the women report that they themselves made this decision. Regarding the decision on how much of the harvest to sell, a much larger share of the male heads also report that it was a joint decision compared to a decision made by them alone. In the female-headed households this decision was largely made by the woman alone, although in some cases it was made by the woman and a son. This study well illustrates the point that it cannot always be assumed that the household head is the lone decision-maker.

A study of three districts in Uganda investigated both men’s and women’s land rights and participation in agricultural decision-making. Bomuhangi, Doss, and Meinzen-Dick (2011) find that while men’s land rights are much stronger than those of women, there is little difference in the share of men and women who participate in four agricultural decisions: what crops to grow, what inputs to use, what to sell, and who keeps the revenue from sales. The authors suggest that these results reflect the high degree of involvement of women in both agricultural production and management.<sup>5</sup>

For Latin America, where peasant agriculture is often characterized as a family farming system, joint decision-making between husband and wife is quite common but often varies depending on the type of decision. For example, in a stratified random sample of 105 mestizo farming households in Cajamarca, in the northern Peruvian highlands, Deere and León de Leal (1982, tables 24–26) find that in a large share of households that include a principal couple, decisions are made jointly by the husband and wife, often with the participation of their children. In 32% of households

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<sup>5</sup> Other studies for Africa that have investigated agricultural decision-making, such as that of the International Center for Research on Women studies in South Africa and Uganda, focus on the rights of each individual to participate, rather than actual participation in a given time period. Constructing an index of whether an individual may participate in decisions involving land transactions, inheritance, what to grow or sell, and disposition of any income generated, Jacobs et al. (2011) and Kes, Jacobs, and Namy (2011) find that women have weaker decision-making rights than men, particularly those residing in male-headed households.

women participate jointly with their spouses in decisions with regard to the organization of production (deciding what is to be cultivated and when, arranging for nonfamily labor, and coordinating the field work), in 35% in terms of decisions over inputs, and in 43% over how much of the crop should be sold, bartered, or allocated to consumption or animal feed. Moreover, in a significant share of households the woman herself makes these decisions without the participation of her spouse (in 10%, 32%, and 45%, respectively). When respondents were initially asked in the survey who was responsible for agricultural production, almost two-thirds of the households replied that it was the male household head (Deere 1990, table 40), reinforcing our earlier point that survey respondents often confound the principal agriculturalist or manager with the head of household, particularly when they are not given the opportunity in the survey instrument to indicate more than one person.

Another small-scale survey, of 108 indigenous households in the municipality of Salcedo in Ecuador, finds that women's participation and joint decision-making are even more prevalent than in northern Peru (Hamilton 2000). According to the women interviewed in households constituted by a principal couple, in 84% they have equal or greater say than their husbands in land use decisions (when, what, and how much to plant of a given crop) and in 71% with respect to the choice of agricultural technology. The men were interviewed about their wives' participation in decisions over the income generated from sales, and in 92% of the households they report that their wives have either equal say or greater control over crop income. Hamilton sums up her results with the following quote from a respondent: "Women do not make decisions. Men do not make decisions. Women and men make decisions together. Both participate or there is no decision, there is no action" (Hamilton 2000, 74).

Nonetheless, there is also considerable variation in the Andes in regard to both women's participation in agricultural field work and decision-making. Deere and León de Leal (1982), comparing the results of two small-scale surveys of peasant agriculture in

Colombia with the survey from northern Peru, report that women are much more active participants in field work in the Peruvian region of Cajamarca than in either Colombian region. Moreover, they suggest that family farming systems need to be further differentiated as egalitarian or patriarchal. In an egalitarian family farming system, such as that in Cajamarca, both men and women provide labor and share in decision-making (either making joint decisions or specializing in certain types of decisions). In patriarchal family farming systems, more typical in Colombia, both men and women provide labor, but men control the decision-making aspects relevant to production and distribution. Within each region there is also variation, with more egalitarian family farming systems more common among smallholders than among peasants with sufficient land for agriculture to provide full-time employment for at least one or more family members.

Casting a broader sweep, Kleysen and Campillo (1996) summarize the results of small-scale surveys carried out in 18 different Latin American countries as part of the Inter-American Development Bank and Inter-American Institute for Agricultural Development (BID-IICA) project on rural women food producers. They conclude that besides being actively engaged in field work, rural women participate in a broad range of decisions regarding agriculture. The majority of decisions are made together by men and women, and where decisions are made by only one person, they find that it is more likely that they are made by women than by men alone. They also suggest there is wide regional variation in these patterns, with some countries, such as Colombia, Peru, and Uruguay being characterized by male decision-making processes, others, such as Ecuador, where joint decision-making predominates, and a few Caribbean countries, such as Barbados, where women are the primary decision-makers.

Most of the studies on Latin America cited above are concerned with the relationship between women's participation in field work and agricultural decision-making, assuming that there is an association between them. Until



recently few studies have examined the relationship between women's ownership of land and decision-making.<sup>6</sup>

### III. FACTORS THAT INFLUENCE WOMEN'S PARTICIPATION IN AGRICULTURAL DECISION-MAKING

The literature on intrahousehold bargaining posits that the distribution of decision-making within the household is related to the intrahousehold allocation of resources and wealth. This proposition is rooted in household theories that link a woman's bargaining power and gendered outcomes to her relative fall-back position or threat-point (Manser and Brown 1980; McElroy and Horney 1981; Lundberg and Pollak 1994; Carter and Katz 1997). This literature suggests that a woman's bargaining power ultimately depends on the outside options that she has, which determine how well off she would be if cooperation within the household failed. Factors related to a woman's fall-back position include her ownership of assets, particularly land in rural areas, her employment, and the extent to which she can count on extra-household support from family, the community, and the state. Whether a woman's relatively strong fall-back position translates into greater household bargaining power, however, is conditioned by the legal framework and social norms in the region where she lives and, not the least, by perceptions about each member's contribution (Sen 1990; Agarwal 1994).

Several studies examine the relationship between women's ownership of land and household expenditures. For example, Katz and Chamorro (2003) find that in Nicaragua women landowners administer a much larger share of household income than in farming households where women do not own land, holding all else constant. However, such studies do not consider how women's land ownership is directly related to decision-making. Other recent studies focus on women's ownership of land and their participation in household decisions such as healthcare, large household purchases, purchases for daily needs, and visits to friends and family (see, e.g., Allendorf 2007). Nonetheless, no studies that we know of examine the relationship between women's landownership and their role in agricultural decisions, a gap in the literature that we seek to fill.

Following the intrahousehold bargaining framework, in this paper we focus on women's asset ownership, particularly the form of land ownership (whether a woman is the only owner or a joint owner) and women's share of couple wealth as indicators of their fall-back position and, thus, bargaining power within the household. Also, we posit that women's participation in field work is a key variable in whether they participate in agricultural decision-making.

#### Women's Ownership of Land

The literature concerned with women's economic empowerment and bargaining power suggests that asset ownership will increase women's say in household decisions. We investigate whether women landowners' participation in agricultural decision-making varies depending on whether they are joint or individual landowners, a question that has not been explored empirically.<sup>7</sup> Agarwal (1994) argues that individual land ownership is potentially more empowering for women in South Asia, since women and men may have

<sup>6</sup> Deere, Alvarado, and Twyman (2012) attempt to do so with the LSMS data sets for Latin America and find these to be deficient for this task. Only two, for Honduras and Nicaragua, of the 167 instruments reviewed, collected data on both land ownership and farm management by sex. While data on land ownership was available at the parcel level, the information on the agricultural decision-maker was gathered only at the household level; moreover, detailed sex-disaggregated data was not gathered on any of the specific decisions that make up farm management. They find that in both countries women are a much lower share of the reported farm managers than of the parcel owners. Given the inappropriate way that data was gathered on decision-making, however, it cannot be concluded that female landowners do not always manage their own farms or are not involved in decision-making.

<sup>7</sup> Information on participation in agricultural decision-making was collected only from men and women who reported they were landowners, not from the full sample. Therefore, we cannot examine differences between owners and nonowners.

different priorities and women are more likely to be able to act upon these if they own their own parcel outright and do not have to negotiate with their husbands. Moreover, individual ownership offers women a stronger fall-back position to escape intimate partner violence (Panda and Argawal 2005). In the case of marital dissolution it may be difficult for women to claim their rightful share if the land is owned jointly. Deere and León (2001, 226) concur that individual ownership probably gives women the strongest bargaining power: "If women own their land outright, rather than through a joint title with men, it is more likely that ownership will result in their direct control of it and its benefits." We thus predict that individual land owners will be more likely than joint owners to participate in agricultural decisions over their plots.

### **Women's Share of Couple Wealth**

The bargaining power framework focuses on the relative power between husband and wife and assumes that the person with the strongest fall-back position has more say in household decisions. As such, the absolute wealth of a woman is not as important as her wealth relative to her husband. Thus, we include a variable that measures the wife's share of couple wealth. It is expected that women with a greater share will have greater bargaining power and therefore be more likely to participate in household decisions (including agricultural decisions).

### **Women's Participation in Field Work and Off-farm Employment**

The literature on farm-household models tends to focus more on the question of household labor allocation than on farm decision-making (Barnum and Squire 1979; Ellis 1988; de Janvry, Fafchamps, and Sadoulet 1991). These analyses tend to conceptualize the household as one where members allocate their time to on-farm production, off-farm production, and/or the production of household goods, usually implying that there is a trade-off between participating in agricultural

field work and in other activities, without explaining the gender division of labor.

In the new household economics framework, the gender division of labor is explained in terms of the relative opportunity costs of men and women in the labor market, which usually predicts a "traditional" gender division of labor—with women specializing in the production of household goods and men in off-farm production. However, in these models the agricultural division of labor is not typically considered. Who in the household owns the land and how this affects who participates in agriculture and makes crop decisions are rarely taken into account explicitly.

Drawing on the results of previous studies in Latin America, we hypothesize that women who participate in field work will be more likely to participate in agricultural decisions than women who do not. In certain circumstances, performing field labor results in an "earned right" to have voice, particularly when women assume tasks typically associated with men in the gender division of labor. Moreover, women who perform field work are also more likely to identify as farmers. In the case of women landowners, working in the field might signal a woman's commitment to farming as an occupation and increase the likelihood that she will engage in decision-making.

We also control for women's participation in off-farm and own-account, nonagricultural, income generating activities, in order to capture the economic opportunities available to women beyond agricultural work on their own farm. Furthermore, the standard economic and sociological models predict that women's access to resources—specifically their greater education, labor force participation, and/or earnings—enhances their bargaining power (Agarwal 1994; Vyas and Watts 2009; Doss 2014). If this is the case, we would expect off-farm employment to be associated with greater say in household decisions (specifically those decisions in which women want more say). However it is unclear if off-farm employment would necessarily increase women's participation in agricultural decisions, given time constraints that would limit their ability to participate in agriculture.

### Other Factors Affecting Women's Participation in Agricultural Decision-making

Following the literature on women's economic empowerment, in our empirical examination we control for differences in age and education among the spouses (also controlling for absolute age and years of schooling). Pronounced differences in favor of husbands over wives may be associated with women's subordination to men (Kishor and Subaiya 2008) and their lower participation in agricultural decision-making. We also control for whether the couple is indigenous, since in Ecuador indigenous women are much more involved in agricultural production than mestiza women (Hamilton 1998), and whether the plot was used for crop production in the past year, rather than perennials or pasture, since that might affect the range of decisions to be made. Other control variables include the wealth tertile of the couple (to control for socioeconomic status), the number of adults besides the principal couple (to control for the size of the household labor force), and whether the couple resides in a rural or urban area.

### Do Couples Agree on How Household Decisions Are Made?

An additional factor that influences how decisions are made within the household, and how they are perceived to be made by its members, is the degree of coordination and information sharing that occurs among the members of the household. While some authors contend that marriages are stable relationships where information about each other's actions is shared and income is pooled to achieve "efficiency" as a unit (Browning and Chiappori 1998; Chiappori and Ekeland 2006), others argue that there are asymmetries between individuals with respect to the information they have access to and the degree of independence with which they make decisions (Carter and Katz 1997; Fletschner 2009).

There is now some evidence for developing countries on the degree to which couples disagree over how household decisions are

made and, specifically, regarding whether wives participate in household decision-making. Jejeebhoy (2002), for example, finds for north and south India that 25% to 50% of couples disagree on whether wives participate in three basic household decisions. Similarly, in Guatemala, Becker, Fonseca-Becker, and Schenck-Yglesias (2006) report that couples in 28% to 36% of households disagree about who is involved in making four basic decisions. Ghuman, Lee, and Smith (2006) investigating why couples often disagree on who is making certain decisions, in five South Asian countries, conclude that men and women have different cognitive thresholds or understanding of a question. These findings add a further layer of complexity to the question of who participates in agricultural decision-making, since it seems to matter who is asked about decision-making and how such questions are posed. Moreover, if coordination is not perfect and information does not flow well within households, then it seems important in household surveys to interview more than one person. In this article we also contribute to this literature by examining wives' participation in agricultural decision-making from the perspectives of the husbands and the wives separately.

## IV. EMPIRICAL ANALYSIS

In this study we focus on agricultural decision-making by women landowners who are married or in a consensual union. We limit our sample to women owners who are partnered in order to investigate intrahousehold factors influencing women's participation in decision-making.<sup>8</sup> Our analysis is based on the EAFF (2010), a nationally representative and sex disaggregated survey carried out by the Latin American Faculty of Social Sciences and the University of Florida.<sup>9</sup> The survey, based on a stratified random sample, is representative of rural and urban areas and the

<sup>8</sup> The case of nonpartnered women is examined separately and is available upon request.

<sup>9</sup> The survey was carried out as part of the Gender Asset Gap project, which includes, in addition to Ecuador, Ghana and the state of Karnataka in India. For the initial comparative results from this project, see Doss et al. (2011).



two major regional geographic and population groupings of the country, the sierra (highlands) and coast (Deere and Contreras 2011).

The subsample we draw upon for this analysis is heavily engaged in agriculture. Some 96% of the men and 87% of women are economically active, and of those, 65% of the men and 73% of the women declare agriculture to be their principal occupation. Of these, most would be considered peasants since they are self-employed or unpaid family workers on their own land plots (88% of the men and 92% of the women), with a minority engaged primarily as agricultural wage workers. Among both men and women whose primary occupation is not peasant agriculture, it constitutes their secondary occupation.

The first part of our empirical analysis uses descriptive statistics and cross-tabulations to examine (1) the perceptions of men and women regarding land ownership, (2) perceptions of how agricultural decisions (what to cultivate, which inputs to use, how much of the harvest to sell, how to spend the money from sales)<sup>10</sup> are made, and (3) the relationship between how decisions are made and how land is owned. We thus examine the question of how likely it is that female landowners are engaged in agricultural decision-making on their own plots.

We then use regression analysis to investigate the factors that may influence women landowners' participation in agricultural decision-making. We create an index of women's participation in agricultural decision-making (at the parcel level), which takes values between zero and one, and use it as the dependent variable in a random-effects tobit regression. Furthermore, we compare the perceptions of women with those of men regarding how much women participate in decision-making. Thus, we have two regressions with

two different participation indexes, one based on the information provided by women and the other based on husbands' perceptions of their wives' participation in decision-making. This allows us to test whether it makes a difference who you ask about decision-making in a household survey.

The specific regression model estimated has the following general form

$$y_{ijh}^* = \mathbf{x}_{1ij}\beta_{1h} + \mathbf{x}_{2ij}\beta_{2h} + \mathbf{v}_i + \varepsilon_{ijh},$$

where  $y_{ijh}^*$  denotes the participation of a woman  $i$  on plot  $j$ , as perceived by household member  $h$  (principal female or principal male),  $\mathbf{x}_{1ij}$  is a set of variables of interest that explain participation, as explained above, and  $\mathbf{x}_{2ij}$  is a set of additional controls such as demographic variables (Tables 1 and 2). Our observed participation measure, however, is the index  $y_{ij}$ , which takes the values: 0 if  $y_{ij}^* < a$ ,  $y^*$  if  $a \leq y_{ij}^* \leq b$ , and 1 if  $y_{ij}^* > b$ . The variable  $\mathbf{v}_i$  is an independently and identically distributed (iid) individual specific unobserved effect, with distribution  $N(0, \sigma_v)$ . Finally,  $\varepsilon_{it}$  is also an iid random variable, assumed to be normally distributed, with the mean of zero and variance of  $\sigma_e$ . Because some of our explanatory variables are endogenous, we use instrumental variables  $\mathbf{z}$  to obtain their predicted values  $\hat{\mathbf{x}} = \mathbf{z}\gamma_1 + \mathbf{x}_2\gamma_2$ . In particular, we use the difference between men's and women's parents' assets and literacy to instrument for female share of wealth,<sup>11</sup> we use an indicator of whether they live in the coastal region of Ecuador to instrument for field

<sup>10</sup> The agricultural module included four questions regarding decision-making for each owned land parcel, referring to the previous 12 months: who in the household made the decision on what to plant; who made the decision on what inputs to use; if some of the harvest was sold, who made the decision on how much to sell; and who decided how to spend the money generated from the sale. The question of "who" was asked in the plural in Spanish, and space was provided for up to two people to be listed among those who made the decision.

<sup>11</sup> The questionnaire provides information on whether the parents of the respondent owned their own home, agricultural land, or nonagricultural land. If the parents of the woman or man owned their own home plus either agricultural or nonagricultural land, they are assigned a value of one, and zero otherwise. The instrument is the value corresponding to the man's parents less that of the woman's, and serves as a proxy for the likelihood of inheritance. In the case of literacy, which is reported for each parent, if neither parent was literate this takes a value of zero, if one parent was literate, the value of 1, and if both parents were literate, the value of 2. The instrument is once again based on the difference between the value of the man's parents compared to the woman's.

TABLE 1  
Descriptive Statistics for Continuous Variables of Paired Sample, Ecuador 2010

	<i>n</i>	Min.	Max.	Mean	Std. Dev.
Wife's share of couple wealth	182	0.014	0.991	0.476	0.153
Wife's age	182	23	82	52.76	12.574
Husband's age	182	23	90	57.17	12.784
Age difference <sup>a</sup>	182	-7	29	4.41	5.451
Wife's years of schooling	182	0	18	4.47	3.607
Husband's years of schooling	182	0	18	5.68	3.953
Difference in years of schooling <sup>a</sup>	182	-9	12	1.21	3.347
Number of other adults in household <sup>b</sup>	182	0	6	1.19	1.282
Ratio of women to men in household	182	0	4	0.77	0.541
Ratio of dependents to working-age adults in household	182	0	2	0.16	0.320
Difference between husband's and wife's parents' literacy	182	-2	2	-0.07	0.762
Difference between husband's and wife's parents' assets	182	-1	1	0.03	0.634

Source: Data from EAFF 2010.

<sup>a</sup> This is the difference between men's and women's age and years of schooling (*husband-wife*).

<sup>b</sup> Number of adults besides the principal couple.

work,<sup>12</sup> and the ratio of working-age women to working-age men to instrument for off-farm work.<sup>13</sup> These regressions and a discussion of the diagnostic tests performed are presented in the Appendix.

The dependent variable, the index of women's participation in decision-making over the parcel, was created in a two-step process. First, each decision is given a value of zero or one: one if the woman participates (either alone or jointly) in making the decision and zero otherwise. Second, the values are summed across decisions, and that total is divided by the total number of applicable decisions for the particular parcel. The resulting index (calculated separately with men's and women's responses) is presented in Figure 1.

Since Ecuador's population is now largely urban, only 12.4% of households nationally

TABLE 2  
Descriptive Statistics for Categorical Variables, Composition (Percent) of Paired Sample, Ecuador 2010

	Paired Sample, <i>n</i> = 182 (%)
Wife is joint owner, as reported by women	94.5
Wife is joint owner, as reported by men	84.6
Wife participates in field work, as reported by women	70.9
Wife participates in field work, as reported by men	70.4
Wife works off-farm	30.2
Couple is indigenous	20.0
Couple wealth	
Tertile 1 (lowest third)	23.6
Tertile 2 (middle third)	36.8
Tertile 3 (highest third)	39.6
Annual crop grown on parcel, as reported by women <sup>a</sup>	84.1
Annual crop grown on parcel, as reported by men <sup>a</sup>	83.5
Rural	85.7
Coast <sup>b</sup>	15.4

Source: Data from EAFF 2010.

<sup>a</sup> Base category: perennials, forage, or trees grown on parcel.

<sup>b</sup> Base category: highlands (sierra).

<sup>12</sup> Qualitative data, collected from focus group discussions and interviews during field work indicate that the coast region is more patriarchal than the sierra region, with restrictive norms regarding the type of labor that is considered appropriate for women, which limits their participation in field work. Thus it is expected that women will do less field work in the coast than the sierra (see Phillips 1987 and Pontón and Pontón 2008 for similar findings).

<sup>13</sup> We posit that the ability of female landowners to work off-farm or engage in other income generating activities is likely related to the number of adult women in the household who may replace her in domestic labor and child rearing. Conversely, if the composition of the household is male-dominated, since men's opportunity cost in the labor market is higher than women's, she would be less likely to seek work outside the home/farm.

reported that someone residing in the household owned land. In the household inventory, information was reported on a total of 513 owned land parcels. Of these, 29% were owned individually by men, 28.1% individually by women, 34.3% jointly by the principal couple, 2.0% jointly by other or all household

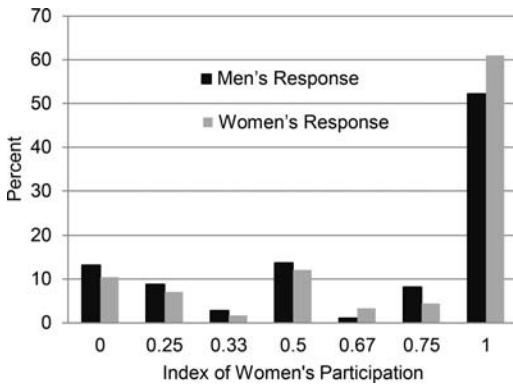


FIGURE 1

Composition (Percent) of Paired Sample at Each Level of the Index of Women's Participation in Agricultural Decision-making as Reported by Partnered Men and Women ( $n = 182$ ; Pearson Chi-Squared = 173.6;  $p < 0.01$ ), Ecuador 2010

Source: Data from EAFF 2010.

members, and 6.6% jointly by a household member and a nonhousehold member.<sup>14</sup> As discussed above, the subsequent analysis is restricted to partnered households and parcels that were cultivated by someone in the household during the previous 12 months for which decision-making information was collected.<sup>15</sup> Furthermore, we restrict the analysis to the 182 parcels on which we have decision-making information from both the husband and the wife so that comparisons can be made.<sup>16</sup> These parcels, which we call the paired sample, are largely jointly owned by the couple,

but the husband and wife do not always agree on who owns these parcels, as will be shown below.

## V. RESULTS

First, Table 3 shows the differences in perceptions regarding land ownership; women consider themselves joint owners of 94% of the parcels in the paired sample and individual owners of 6%. Men, on the other hand, consider themselves joint owners of 85% and individual owners of 15% (i.e., they do not consider their wife to be a joint owner). Overall, couples agree that 79% of the parcels are owned jointly but disagree about the ownership of the other 21%. Interestingly, in this sample the disagreement is always over whether the owner is an individual or a co-owner; it is never the two claiming individual ownership over the same parcel.

Next we examine how likely women landowners are to be engaged in agricultural decision-making on the plots they consider that they own. As shown in the last column of Table 4 (labeled "Total"), women landowners are generally involved in agricultural decision-making on their own plots. Depending on the decision, women participate (either alone or jointly) in the decision-making process on 71% to 94% of their parcels. Table 4 indicates that across the four decisions (what to cultivate, which inputs to use, how much to sell, how to spend proceeds from sales) the form of decision-making is highly correlated with the form of land ownership. On plots owned by partnered women, all four decisions are more likely to be made by women alone when women own these parcels individually than when these are owned jointly with their partners, particularly the decisions regarding how much to sell and the use of the proceeds from a sale. On the other hand, plots owned by women jointly with their partners are much more likely to be characterized by joint decision-making than those plots with sole female owners. Although there seems to be a correlation between the type of ownership and decision-making, it is important to note that ownership does not always imply decision-making for women.

<sup>14</sup> These percentages are weighted, reflecting the sample expansion factors.

<sup>15</sup> There are 244 partnered households that own and work 308 parcels. Of these 308 parcels, women consider themselves an owner (either individually or jointly) of 232 parcels. Men consider themselves an owner of 263 of the 308 parcels owned and worked by partnered households. The sample sizes are further reduced due to nonresponse, and 2 plots that are reported as jointly owned by someone other than the spouse; thus, the final samples for women and men are 228 and 261, respectively.

<sup>16</sup> A  $t$ -test for differences between the paired sample and the rest of the partnered sample of parcels in terms of land size found that although the mean is larger among the former (24 ha vs. 8 ha), the difference is not statistically significant. The percentage of the paired sample working in agriculture is also higher than the overall sample of partnered men and women. This could imply that the analyzed sample has a greater stake in agriculture.

TABLE 3  
Husbands' and Wives' Perceptions of Plot Ownership (Paired Sample)

	Men's Reporting		
	Individual Male	Joint	Total
Women's Reporting			
Individual Female	0 (0%)	10 (5.5%)	10 (5.5%)
Joint	28 (15.4%)	144 (79.1%)	172 (94.5%)
Total	28 (15.4%)	154 (84.6%)	182 (100%)

Source: Data from EAFF 2010.

TABLE 4  
The Participation of Partnered Female Landowners in Agricultural Decisions by Type of Ownership and Level of Participation in Decision-making as Reported by Women

	Individual Owner	Joint Owner	Total
<i>Wife's Participation in Cultivation Decision</i>			
Alone	47.4%	12.1%	17.7%
Joint	25.8%	66.4%	60.0%
No participation	26.8%	21.5%	22.3%
Total	100.0%	100.0%	100.0%
<i>n</i>	35	193	228
<i>Wife's Participation in Input Use Decision</i>			
Alone	45.1%	18.3%	23.0%
Joint	24.5%	53.5%	48.4%
No participation	30.4%	28.2%	28.6%
Total	100.0%	100.0%	100.0%
<i>n</i>	27	137	164
<i>Wife's Participation in Selling Decision</i>			
Alone	58.7%	7.8%	14.7%
Joint	22.6%	67.4%	61.3%
No participation	18.7%	24.8%	24.0%
Total	100.0%	100.0%	100.0%
<i>n</i>	15	100	115
<i>Wife's Participation in Spending Decision</i>			
Alone	66.9%	16.2%	23.1%
Joint	26.1%	78.1%	71.0%
No participation	7.0%	5.7%	5.9%
Total	100.0%	100.0%	100.0%
<i>n</i>	15	100	115

Source: Data from EAFF 2010.

Note: Percentages are weighted reflecting the sample expansion factors, while the *n* values reflect the number of parcels on which someone in the household makes the specific decision.

Further examination of Table 4 indicates there is considerable variation in the degree to which women participate across the different decisions. Irrespective of the form of ownership, partnered women landowners are least likely to participate in the decision regarding the use of the inputs (women had no say regarding 28.6% of the plots), and most likely

to participate in the decision regarding spending the income from crop sales from the plots they owned (only 5.9% were not involved), which is similar to the trend reported by Deere and León de Leal (1982) and Kleysen and Campillo (1996).

It is also worth noting that while there is information about the decision on what to cul-

TABLE 5  
Husbands' and Wives' Perceptions of Who Makes Various Agricultural Production Decisions (Paired Sample)

	Women's Reporting		Men's Reporting	
	Number	Percent	Number	Percent
<i>Cultivation Decision</i>				
Individual male	48	27	59	32
Individual female	15	8	9	5
Joint	117	64	112	62
Others	2	1	2	1
Total	182	100	182	100
<i>Input Decision</i>				
Individual male	46	35	62	46
Individual female	12	9	9	7
Joint	71	55	62	46
Others	1	1	2	1
Total	130	100	135	100
<i>Decision about How Much to Sell</i>				
Individual male	28	30	35	36
Individual female	6	6	4	4
Joint	59	62	58	59
Others	2	2	1	1
Total	95	100	98	100
<i>Spending Decision</i>				
Individual male	7	7	12	12
Individual female	9	10	8	8
Joint	78	82	77	79
Others	1	1	1	1
Total	95	100	98	100

Source: Data from EAFF 2010.

tivate for 228 agricultural plots,<sup>17</sup> the number of observations then decreases for other decisions. Over one-quarter of the female owners report that inputs were not used on their plots, and therefore they did not answer the question regarding who makes decisions on what inputs to use.<sup>18</sup> Moreover, for half the

parcels, the decision on how much to sell or the use of sales income is reported as not applicable, since none of the harvest of the previous year was sold.

Table 5 compares men's and women's responses regarding who made each decision. In this table it is clear that both men and women report joint decision-making as the predominant method for making each of the four decisions. Although there is some degree of disagreement, as shown in the table, we also find that because of the high rate of joint decision-making, there is a relatively high rate of women participating in each decision; in fact they participate in well over half the cases.

Figure 1 gives the distribution of the dependent variable in our regression equation—the index of women's participation in agricultural decision-making. Although both men

<sup>17</sup> This table includes all plots that partnered women report they own. The number of observations is larger than in the paired sample due to disagreements—if husbands do not consider their wives to be owners these plots are not included in the paired sample; other observations were lost due to missing data related to other variables considered in the analysis.

<sup>18</sup> Unfortunately, it appears this question was interpreted as whether they used purchased inputs only, such as improved seed or inorganic fertilizer. If this was how the question was interpreted, then the low percentages associated with women's participation in this decision might be related to their lower access to such inputs as compared to men. Further research would be needed to explore this in more detail.



and women report high levels of women's participation, there are also differences in perceptions between men and women. Women in the paired sample report that they have no participation in agricultural decisions on only 10% of parcels, whereas they report full participation (meaning that they participate in each agricultural decision) on 61% of the parcels. Men in the paired sample tend to report that their wives participate less than the women indicate; they report that women do not participate at all on 13% of the parcels and participate fully on 52% of the parcels. A chi-squared test for differences indicates that there is indeed a statistically significant difference between men's and women's responses.

The descriptive statistics for the continuous explanatory variables in the regression can be seen in Table 1. Wives own 48% of the couple's wealth on average, yet the range in women's share of couple wealth is very broad (from 0% to 99%). The average age of the partnered women in the paired sample is 53, and the average age difference between husbands and wives is 4 years. On average, women have 4 years of schooling (with a median of 6), and men have one year more of schooling than their wives. On average, there is one other adult in the household besides the principal couple.

Table 2 contains the summary statistics for the categorical variables. The first rows show the differences in perspectives on land ownership, as explained above (and in Table 3). Husbands and wives report similar levels of the wife's participation in field work, for 71% and 70% of the parcels, respectively. Some 30% of parcels are owned in households in which the wife works off-farm. Indigenous couples own 20 percent of the parcels, while most are owned by those of other ethnicities (white, mestizo, or Afro-Ecuadorian). Twenty-four percent of parcels belong to couples in the lowest wealth tertile, 37% in the middle tertile, and 39% in the highest wealth tertile. Both women and men report that crops are grown on 84% of their parcels, while on the remaining 16% forages, perennials, or trees are grown. About 86% of parcels are owned by rural residents, while 14% are owned by those residing in urban areas. Fifteen percent of the parcels are

owned by coastal residents and the other 85% by highland residents.

### Regression Results for Index of Women's Participation in Decision-making

Table 6 presents the results of the regression models of women's participation in agricultural decision-making on their own parcels, according to women's and men's perceptions, using random effects to control for household-level effects (that some households own more than one parcel) and instrumental variables to address problems of endogeneity.

In the women's model, the variables that are significant in predicting women's participation in decision-making are the form of land ownership, whether the woman participates in field work or off-farm employment, and her age. Women who are joint land owners are less likely than individual owners to participate in decision-making; as expected, individual female land owners have higher levels of participation in decision-making over their parcels. The predicted variable for women's participation in field work shows that women who participate in field work are also more likely to participate in agricultural decision-making on their own plots than women who do not.<sup>19</sup> In contrast, the predicted variable for participation in off-farm employment (and nonagricultural self-employment) suggests that women who work off-farm are less likely to participate in the decisions regarding their own land plots than those who do not.<sup>20</sup> Finally, holding all else constant, younger

<sup>19</sup> The first-stage regression results for field work show that, as expected, women's participation in field work is significantly higher in the sierra than the coast. Other factors associated with their participation in field work are being part of an indigenous household, being younger than the husband, and the presence of more working-age women compared to men in the household.

<sup>20</sup> The regression predicting this variable shows that women who work off-farm are younger, more urban, and live in households with wealth above the lowest tertile and with fewer women of working age in the household compared to men. Taken together, the predicted equations for off-farm and farm work show that the more adult women to men in the household, the more likely the principal woman will work on the farm as opposed to off-farm.

TABLE 6  
Determinants of Women's Participation in Agricultural Decision-making According to Women and Men: Parcel-Level Tobit Model with Random Effects, Ecuador 2010 (Paired Sample)

	Women's Model Coef. (Std. Err.)	Men's Model Coef. (Std. Err.)
Wife is joint land owner <sup>a</sup>	-0.892*** (0.25)	0.321 (0.21)
Predicted wife's share of wealth	-3.039 (2.71)	4.514*** (1.04)
Predicted that wife does field work	1.137** (0.57)	0.524* (0.31)
Predicted that wife works off-farm	-1.322** (0.56)	1.337*** (0.34)
Wife's age	-0.023** (0.01)	-0.003 (0.01)
Age difference <sup>b</sup>	-0.011 (0.02)	0.022* (0.01)
Wife's years of schooling	-0.034 (0.03)	-0.068*** (0.02)
Schooling difference <sup>b</sup>	0.006 (0.03)	-0.019 (0.01)
Couple is indigenous	0.240 (0.33)	0.644*** (0.20)
Annual crop <sup>c</sup>	-0.126 (0.20)	0.350*** (0.09)
Couple wealth		
Tertile 1 (lowest third)	-0.150 (0.22)	-0.054 (0.13)
Tertile 2 (middle third)	-0.023 (0.17)	-0.096 (0.16)
Number of adults (besides principal couple) in the household	0.027 (0.07)	0.010 (0.03)
Rural	-0.201 (0.31)	-0.145 (0.13)
Constant	4.857*** (1.50)	-2.021*** (0.62)
Number of plots	182	182
Number of households	145	145
Wald chi-squared ( <i>df</i> )	81.99 (14)	113.51 (14)
Log-likelihood	-121.47***	-125.71***

Source: Data from EAFF 2010.

<sup>a</sup> Base category: wife is the individual owner (according to women) or wife is not an owner (according to men).

<sup>b</sup> The difference between men's and women's age and years of schooling (*husband - wife*).

<sup>c</sup> Base category: perennials, forage, or trees grown on parcel.

\*  $p < 0.10$ ; \*\*  $p < 0.05$ ; and \*\*\*  $p < 0.01$ .

women are more likely to participate in agricultural decision-making than older women.

The main variable that is significantly and positively associated with women's participation in decision-making in both the men's and women's model is whether the woman participates in field work. This finding confirms that working in the field is associated with an "earned right" to make decisions and contributes to women's identification as farmers. In contrast, the two models differ on the role of women's predicted off-farm employment and predicted female share of couple wealth. In the men's model, women's off-farm employment is positively associated with a husband's perceptions of his wife's participation in decision-making. Thus in the men's view, off-farm employment represents an outside option that improves women's bargaining power. In contrast, in the women's perception their participation in off-farm employment

represents a trade-off, being negatively related to their role in agricultural decision-making. Most striking is that the predicted female share of couple wealth is positively associated with men's perception of their wife's participation in agricultural decision-making, whereas this variable is not significant in the woman's model and, moreover, is negatively signed.<sup>21</sup> These results indicate that women may be using the bargaining power gained

<sup>21</sup> The main factors significantly predicting the woman's share of wealth are the literacy of the husband's parents and lower numbers of dependents in the household. Male parents' literacy is likely to be associated with schooling attainment and knowledge by the man of the legal property regime, factors that might favor his recognition of his wife's joint property rights in marriage. The difference between male and female parents' immovable property ownership (our proxy for potential inheritance) was not significant, although, as expected, negatively related to women's share of couple wealth.

from a relatively greater share of couple wealth in other ways; they may be leaving agricultural decisions to their husbands, while using their bargaining power in other arenas of household decision-making. However, men perceive that when their wives hold a higher share of couple wealth, they are more involved in agricultural decision-making.

The men's model thus provides considerable support for the bargaining power hypothesis (McElroy and Horney 1981; Manser and Brown 1980; Lundberg and Pollack 1994; Carter and Katz 1997): men perceive their wives to have greater say in decisions when they work off-farm and own a greater share of couple wealth. Interestingly, in the men's model, no highly significant difference ( $p = 0.13$ ) is found between wives being joint land owners versus nonowners (as perceived by men), suggesting that it is not land ownership alone that conveys bargaining power.

A number of the control variables are significant in the men's model but are not so in the women's model. If annual rather than perennial forage or tree crops are grown on the parcel, if men are significantly older than their wives, and whether the couple is indigenous are all positively associated with men's perceptions of greater participation by their wives in decision-making. In contrast, in their perception, the more educated the wives are, the less likely that they will participate in agricultural decision-making. These results confirm our intuition that different factors influence men's and women's perceptions of wives' participation in decision-making.

The fact that men find women more likely to participate in decisions related to annual rather than other types of crops may simply be related to the fact that decisions are made more frequently and therefore the likelihood of women participating in such decisions within the last year is higher. The positive relationship between age difference and women's participation in agricultural decision-making may reflect that older men more frequently need their wives' assistance; note that 25% of the men are 66 years of age or older.<sup>22</sup> The higher participation of women in

decision-making among indigenous couples compared to other couples may be related to Hamilton's (1998) findings that indigenous couples are more egalitarian than mestizos. Finally, more educated women may be able to decide not to participate in agriculture, while less educated women may see it as the only or one of very few options.

To explain why some of these variables are significant in the men's models and not in the women's models it is useful to consider some of the results from the first-stage regressions. For example, while being relatively younger than their husband or being part of an indigenous couple does not have a direct effect on women's perception of participation in decision-making, it has a significant impact on women's participation in field work, possibly through their perception of being a farmer and having an earned right to make decisions (Appendix Table A1, women's field work regression). Further, the participation right that comes from engaging in field work materializes in places with less restrictive norms regarding the type of labor that is considered appropriate for women (the sierra as opposed to the coast) and in households where the ratio of men to women is lower. Hence, the availability of male labor in the household may facilitate women opting out of agriculture altogether.

## VI. DISCUSSION AND CONCLUSIONS

This paper contributes to the literature on women's bargaining power by directly examining the relationship between a woman's participation in agricultural decision-making and variables related to her fall-back position, such as individual or joint landownership, share of couple wealth, and off-farm employment. It advances the literature studying factors related to women's participation in agricultural decisions and if/how these factors might differ from those affecting other household decisions. While the bargaining power framework suggests that assets are important for women's participation in household deci-

<sup>22</sup> The age gap between spouses is also significantly greater for men over 60 (5.7 years) compared to those under

this age (3.2), reflecting changes in cultural practices across generations.

sion-making, it does not examine how such bargaining power will be used; whether increased asset ownership is associated with an increase in all types of decisions, or if women prefer not to participate in some decisions. The analysis presented in this paper provides important insights to address such questions and opens up new avenues of research in agricultural economics by going beyond the analysis of the link between women's asset ownership and outcomes (such as household budget shares, children's nutrition, and education) to examine the direct relationship between asset ownership and women's participation in agricultural decision-making.

Overall we find that women landowners in Ecuador are involved in decision-making on their plots, joint decision-making predominates in Ecuador, the form of landownership is correlated with the form of decision-making, and men's and women's perceptions of women's participation in agricultural decision-making differ. The only factor associated with women landowner's greater participation in agricultural decision-making in the view of both men and women is that the wife is engaged in field work. This finding that women landowners who work on the plot themselves are highly likely to make agricultural decisions regarding the plot supports earlier findings regarding women's participation in agricultural decision-making in Latin America (Deere and León de Leal 1982; Deere 1990; Kleysen and Campillo 1996). Our results also indicate that one factor that contributes to an egalitarian farming system is women's ownership of land. This may, indeed, be a key factor differentiating between egalitarian and patriarchal farming systems, a proposition that should be tested in other contexts.

Since participation in field work is so strongly associated with women landowners' participation in decision-making on the plots they own in this study, we need to know much more about why some women landowners choose not to work on their land parcels. This study suggests that it is potentially women who own their parcels individually that are more secure in their property rights who may opt for a gender division of labor, where farm management is left to the husband. This may be because agriculture is considered a less

prestigious activity than being a housewife since women may prefer not to engage in physical labor, or because smallholder agricultural production is a losing proposition, one that makes up a declining share of household income.<sup>23</sup>

One of the main findings of this study is how men and women have different perceptions of women's participation in decision-making. In Ecuador men tend to report less participation by their wives in agricultural decision-making than the women report. It may be that since we are only examining decision-making among women who are landowners, that ownership of land gives them the confidence to value their own role, irrespective of prevailing social norms that define agriculture as a male occupation. Further research is needed to examine whether this relationship holds for women's participation on plots they do not own.

It is also worth highlighting again the important points on which men and women disagree, such as whether the wife working off-farm and her share of couple's wealth influence her participation in decision-making. These results suggest that the bargaining hypothesis in the literature may be more relevant to how men view their wives than to how women themselves view their own role in decision-making.

These findings should be taken into account when analyzing gender issues in agriculture and collecting agricultural data in household or agricultural surveys. As we have shown, women landowners are making decisions regarding their land parcels and as such are an important source of agricultural information that is often overlooked. This seems especially relevant in households with multiple parcels where there are different forms of ownership (i.e., a jointly owned parcel, a parcel owned by an individual man, and/or a parcel owned by an individual woman). While it

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<sup>23</sup> Most studies of smallholder agriculture in Ecuador consider farming to be a losing proposition. A study based on the 2001 Agricultural Census found that for the 63.5% of farms that consist of less than 1 ha, 58% of household income is generated from nonagricultural activities, and that the dependency on agriculture is higher in the sierra than on the coast (Martínez Valle 2009).

might be convenient for researchers to treat “a household’s parcels” as a single farm, these might not be managed as a single unit, but instead, each parcel may be managed differently, depending on who owns it.

The implications of this analysis are both methodological and programmatic. Methodologically, in addition to disaggregating farm decision-making, it seems important to interview both the man and the woman in a household, since they often have different perceptions. Programmatically, all those who are involved in making the farm decisions should be targeted to maximize the chances that a program will be successful.

We hope that the results of this study spur efforts of national and international organizations to collect individual-level data on land ownership and disaggregated data on agricultural decision-making. While this paper focuses on a relatively egalitarian family farming system in the Andes, where women are landowners and play an important role in farm management, it is important to understand the relationship between land ownership and agricultural decision-making in other contexts, such as sub-Saharan Africa and Asia, where women are less likely to be landowners.

## APPENDIX

Regression results for the instrumental variables are presented in Appendix Table A1. We use standard diagnostic tests to scrutinize the validity and strength of the instruments.<sup>24</sup> First, we performed the GMM-C (difference-in-Sargan) statistical test, which determines whether the endogenous regressors in our model may in fact be exogenous.<sup>25</sup> This statistic is

asymptotically distributed as a chi-squared, with three degrees of freedom in our case. The value of the statistic is 9.912, yielding a  $p$ -value of 0.0193. The small  $p$ -value indicates that we may reject the null hypothesis of exogeneity. Thus, we test for the validity of the instruments, with Hansen’s (1982) overidentification test. The value of Hansen’s  $J$ -test (distributed as a chi-squared with two degrees of freedom) is 0.0615 and its  $p$ -value 0.804. This implies that the null hypothesis that our instruments are valid cannot be rejected. Finally, in order to determine the strength of the instruments we use the standard procedure of examining the first-stage regressions’ measure of fit. We analyze the McFadden rho-squared measure of the pseudo- $R^2$  value, which is based on likelihood function values and is suited for noncontinuous variable regressions.<sup>26</sup> This pseudo- $R^2$  measure in the off-farm employment regression takes the value of 0.1798, in the female field-work regression from the perspective of the woman it is 0.2328 and from the perspective of the man, 0.2654, and in the woman’s share of wealth regression it is  $-0.1074$ . Because pseudo- $R^2$  values rely on differences in the likelihood function evaluated at the estimated parameters and at the value of zero, they generally do not reach values higher than 0.4 and can be negative for mixed continuous/discrete likelihoods like tobit. In fact, McFadden (1979, 306) points out that “while the  $R^2$  index is a more familiar concept, it is not as well behaved as the rho-squared measure for ML estimation. Those unfamiliar with rho-squared should be forewarned that its values tend to be considerably lower than those of the  $R^2$  index. For example, values of 0.2 to 0.4 for rho-squared represent excellent fit.” Thus, the latter values indicate very strong instruments in the field-work equations, good instruments in the off-farm employment one, and weak instruments for the female share of wealth. When run as linear models, the  $R^2$  measures give us the same order of strength. The  $t$ -statistics for the individual instruments imply the same strength ranking. Thus, while valid, our instruments for female share of wealth are weak, meaning that the coefficient for this variable may be biased. For this reason we do not focus on the magnitude of our results in the interpretation, but merely on the sign of the coefficients.

<sup>24</sup> We follow the recommendation of an anonymous reviewer and use a linear regression framework to perform the diagnostic tests for instrumental variables that have not yet been adapted to random-effects tobit models.

<sup>25</sup> We rely on GMM-C rather than on Durbin-Wu-Hausman because our number of instruments is larger than the number of endogenous variables.

<sup>26</sup> In this case, we do not rely on standard  $F$ -statistics,  $R^2$  or adjusted- $R^2$  values since our first-stage dependent variables are not continuous.



TABLE A1

First-Stage Regressions for Predicting Women's Off-farm Work, Women's Field Work, and Women's Share of Couple Wealth (Paired Sample)

	Women's Off-farm Work, Coef. (Std. Err.)	Women's Participation in Field Work as Reported by Women, Coef. (Std. Err.)	Women's Participation in Field Work as Reported by Men, Coef. (Std. Err.)	Women's Share of Couple Wealth, Coef. (Std. Err.)
Crop grown on parcel	0.729 (0.61)	0.718 (0.52)	1.159** (0.54)	-0.046 (0.03)
Wealth tertile 1	-1.293** (0.621)	0.038 (0.57)	1.004 (0.63)	0.004 (0.03)
Wealth tertile 2	0.193 (0.45)	-0.223 (0.49)	0.816 (0.53)	-0.001 (0.03)
Woman's age	-0.065*** (0.02)	-0.012 (0.02)	-0.026 (0.02)	0.001 (0.001)
Age difference	-0.085** (0.04)	0.122*** (0.05)	0.047 (0.04)	-0.0001 (0.002)
Woman's years of schooling	-0.010 (0.07)	-0.052 (0.08)	-0.036 (0.08)	0.002 (0.004)
Schooling difference	0.058 (0.06)	0.060 (0.07)	0.099 (0.08)	-0.003 (0.004)
Number of adults besides principal couple	0.120 (0.15)	0.012 (0.17)	0.222 (0.20)	-0.012 (0.01)
Rural	-1.069** (0.54)	-0.118 (0.59)	-1.401* (0.74)	0.024 (0.03)
Indigenous couple	-0.339 (0.55)	2.234*** (0.86)	0.862 (0.69)	-0.038 (0.03)
Wife is joint land owner	-0.951 (0.84)	-0.230 (0.90)	1.880*** (0.56)	-0.074 (0.05)
Coast	-0.079 (0.60)	-1.356** (0.55)	-1.779*** (0.59)	-0.019 (0.03)
Ratio of women to men in household	-1.406*** (0.48)	0.971** (0.47)	0.263 (0.43)	-0.007 (0.02)
Ratio of dependents to working-age adults	0.854 (0.66)	-1.028 (0.70)	-0.567 (0.64)	-0.066* (0.02)
Difference in men's and women's parents' literacy	-0.042 (0.25)	0.051 (0.26)	0.159 (0.29)	0.026* (0.01)
Difference in men's and women's parents' assets	0.319 (0.31)	-0.417 (0.33)	-0.249 (0.33)	-0.011 (0.02)
Constant	5.013** (2.03)	0.488 (1.94)	0.210 (1.92)	0.544 (0.11)
Log-likelihood	-91.469	-84.235	-81.292	93.294
Pseudo- $R^2$	0.1798	0.2328	0.2654	-0.1074

Source: Data from EAFF 2010.

\*  $p < 0.10$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$ .

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