

Der Open-Access-Publikationsserver der ZBW – Leibniz-Informationzentrum Wirtschaft
The Open Access Publication Server of the ZBW – Leibniz Information Centre for Economics

Lay, Jann; Golan, Jennifer

Conference Paper

The Impact of Agricultural Market Liberalisation from a Gender Perspective: Evidence from Uganda

Proceedings of the German Development Economics Conference, Frankfurt a.M. 2009, No. 20

Provided in cooperation with:

Verein für Socialpolitik

Suggested citation: Lay, Jann; Golan, Jennifer (2009) : The Impact of Agricultural Market Liberalisation from a Gender Perspective: Evidence from Uganda, Proceedings of the German Development Economics Conference, Frankfurt a.M. 2009, No. 20, <http://hdl.handle.net/10419/39944>

Nutzungsbedingungen:

Die ZBW räumt Ihnen als Nutzerin/Nutzer das unentgeltliche, räumlich unbeschränkte und zeitlich auf die Dauer des Schutzrechts beschränkte einfache Recht ein, das ausgewählte Werk im Rahmen der unter

→ <http://www.econstor.eu/dspace/Nutzungsbedingungen> nachzulesenden vollständigen Nutzungsbedingungen zu vervielfältigen, mit denen die Nutzerin/der Nutzer sich durch die erste Nutzung einverstanden erklärt.

Terms of use:

The ZBW grants you, the user, the non-exclusive right to use the selected work free of charge, territorially unrestricted and within the time limit of the term of the property rights according to the terms specified at

→ <http://www.econstor.eu/dspace/Nutzungsbedingungen>
By the first use of the selected work the user agrees and declares to comply with these terms of use.

The Impact of Agricultural Market Liberalisation from a Gender Perspective: Evidence from Uganda[†]

Jennifer Golan* and Jann Lay**

* University of Manchester, UK

** Kiel Institute for the World Economy, Germany

Abstract

Focusing on intra-household allocation, we investigate the effects of coffee market liberalisation in Uganda. As coffee has traditionally been a male domain, higher income from this activity might increase gender disparities. In addition, gender-related inefficiency in household production might undermine the positive impact of improved incentives. Using data from three household surveys conducted between 1992 and 2006, we estimate Engel curves, coffee yield and labour input equations incorporating bargaining proxies. We find that income from coffee is increasingly pooled and therefore shared more equally among household members. Yet, we can only detect partial improvements in production efficiency: bargaining still appears to constraint output efficiency and the distribution of household resources continues to follow gendered lines.

[†] The authors gratefully acknowledge funding from the World Bank Netherlands Partnership Program (BNPP)-funded project „Trade, Growth and Poverty in the Developing World“ and the Poverty Reduction, Equity and Growth Network's (PEGNet) research exchange facility. We would like to thank Rafael de Hoyos, Erik Thorbeke, and Alan Winters for helpful comments on the paper. We are highly indebted to Sarah Ssewanyana from the Economic and Policy Research Centre and James Muwonge from the Uganda Bureau of Statistics for their help with the Uganda National Household Survey 2005/06 and for making it available to us.

Table of contents

Introduction	1
Analytical Background and Previous Findings	2
Household Survey Evidence from Uganda	5
<i>Coffee income is increasingly pooled</i>	5
<i>More cooperation in coffee production?</i>	9
Conclusion.....	12
References	14
Appendices	17

Introduction

This paper intends to extend the “trade and gender” debate to agricultural economies of Sub-Saharan Africa by looking at the gendered consequences of cash crop market liberalisation. More specifically, it investigates the effects of coffee market liberalisation in Uganda with a focus on intra-household allocation.

By affecting the households’ production and consumption structure, trade reforms can have an important impact upon households’ resource allocation patterns and herewith on the existing gender relations. However, the evidence on the gendered effects of cash crop market liberalisation is scarce although there is some anecdotal evidence in various policy documents for negative effects and the exclusion of women. Furthermore, most gender analyses tend to focus on barriers to women from a static perspective and have very little to say on whether these barriers have possibly changed although some anthropological evidence points to changes in gender roles in East Africa (see for example Silberschmidt, 2001; Dolan, 2001).

We aim at filling these empirical gaps by investigating the case of coffee in Uganda, a country where thorough sector reforms have triggered a substantial supply response. We use data from three household surveys conducted between 1992 and 2006 to quantitatively examine the gendered impact from coffee production expansion. In order to assess changes in the intra-household resource allocation related to changes in coffee income, we examine whether the share of coffee income positively (negatively) affects the expenditure shares on male (female) goods by estimating Engel curves for a number of more or less gender-specific goods. We find that the share of household income derived from coffee had some impact on household expenditure patterns in the early 1990s, but that this effect appears to have vanished by today. Thus, coffee income seems to be more equally distributed between men and women in the early 2000s. As increased income pooling may indicate more cooperative household consumption behaviour, we expect men and women to cooperate better in coffee production. However, coffee yield and in particular labour input estimations indicate that intra-household struggles over resources for coffee production as well as agricultural gender roles persist.

The paper first provides a short review of the literature on gender roles in agriculture, intra-household resource allocation and bargaining processes that is relevant to understand the transmission channels of trade reform in the rural context. We then present the respective methodological frameworks and the empirical results. A final section concludes.

Analytical Background and Previous Findings

Analysing the gendered welfare impact of trade reforms and increased trade flows in the context of a poor agricultural economy requires an in-depth understanding of household decision processes. The unitary model of household behaviour provides a useful starting point for this discussion. The model assumes that household members behave as if they were to maximise a well defined and uniform household welfare function and that within the household all resources (land, labour, and capital), and consequently, all production and/or incomes from factor markets are pooled. If the unitary model of household behaviour were to apply, the gender effects of trade reforms would be negligible because all household members would benefit equally from possible efficiency improvements.

However, not surprisingly, there exists plenty of evidence against the unitary model and the resource pooling assumption in particular. For instance, Hoddinott and Haddad (1995) using data for Côte d'Ivoire from the late 1980s show that the income share earned by female household members impacts on expenditure pattern raising expenditure on food and lowering those for alcohol and tobacco expenditure, herewith rejecting the existence of income pooling. Quisumbing and Maluccio (2003) use more recent datasets for Bangladesh, Ethiopia, Indonesia, and South Africa to test the income pooling hypothesis and also reject the unitary model, yet to different degrees.

These findings lend support to household models where the household's interests are not pursued via maximising a uniform welfare function. Rather, individuals have diverse preferences and household as well as individual welfare result from bargaining struggles over household resources. If individuals have diverse preferences there is no a priori reason to give up control over individually earned income. In bargaining models there is hence no supposition of income pooling within the household.

Different bargaining models have been proposed in the context of household resource allocation. In contrast to the unitary model, cooperative household models allow household decision makers to have different preferences. Outcomes of the bargaining process are assumed to be Pareto-efficient, which under preference diversity implies that households dispose of efficient sharing rules. In other words, they are able to negotiate adequate compensations to achieve efficient resource allocations. While Pareto-efficiency has been shown in empirical studies of household allocations in developed countries (Bourguignon *et al.*, 1993, 1994; Browning and Chiappori, 1998; Thomas and Chen, 1994), they have been rejected in the rural Sub-Saharan context by various studies.

For instance, in his examination of farm households in Burkina Faso, Udry (1996)

finds that female plots exhibit substantially lower yields because they are less intensively farmed. Due to diminishing returns, households could increase production for example by reallocating inputs, primarily labour, from male to female plots. This implies that prevailing bargaining processes, i.e. sharing rules and negotiated compensations, do not lead to efficient outcomes. The lack of such processes is also documented by Jones (1983) who provides evidence from North Cameroon. Her findings suggest that married wives do not allocate enough labour to rice production due to inadequate compensation. Again, both men and women would gain if married women were compensated for allocating less time to “their” sorghum and more time to “men’s” paddy rice production. In a slightly different setting, Udry and Duflo (2004) analyse cooperative behaviour in Ivorian households using panel data from 1985-1988. Assuming that efficiency requires household members to insure against short-term income fluctuation due to rainfall, they reject Pareto efficiency. Moreover, in a recent study using rural Ethiopian data from the late 1990s and applying a variety of stochastic efficiency estimations, Seebens and Sauer (2007) find that relative bargaining asymmetries within the household as captured by the distribution of land and livestock brought to marriage impact adversely on the household efficiency in production.

Taken together, quite some evidence has been accumulated against both Pareto-efficiency and income pooling, particularly in agrarian settings. Thus, at least partly non-cooperative behaviour within rural households seems to prevail.

These results maybe explained by the following three factors that often complicate negotiations in the Sub-Saharan African context: First, household members typically jointly contribute to agricultural production. While wages of individual household members, as in more developed economies, are easily observed, this does not hold for individual marginal agricultural product. Second, the number of tasks is much larger in poorer countries. On top of agricultural and non-agricultural activities, it includes the labour-intensive production of a number of household public goods, such as water fetching, cooking or herding. These activities would need to be taken into account when compensation agreements are achieved. Third, households have to negotiate under strong cultural gender roles, for example the exclusion of women from certain agricultural activities.

Obviously, intra-household processes and changes therein are of utmost importance for an evaluation of the gendered impact of trade reform (Alderman *et al.*, 1995, 1997). Yet, there are very few empirical assessments of changes in bargaining processes and gender roles, less so in response to policy shocks. One exception in this regard is Newman’s (2002) study on the gendered impact of increased female employment in the cut flower industry in

Ecuador. She reports important behavioural change and finds a reallocation of housework to husbands due to increased bargaining power of the wives in cut-flower regions.

For the Ugandan case, there is in general very little evidence on the gendered impact of trade reform and, in particular, coffee market liberalisation. Some rather anecdotal evidence of the effects can be found in policy documents (Baden, 1993; Elson and Evers, 1996; World Bank, 2005). Elson and Evers (1996: 21) for example suggest that “the economic reform programme has not only failed to reduce [...] gender distortions and barriers – it has intensified many of them”.

Although there is a lack of evidence on the effects of reforms it seems to be fairly well established that coffee production in Uganda relies heavily on female labour inputs in the production process while marketing and control over coffee income lie in male hands (Bantebya and Keniston, 2006; Elson and Evers, 1996; Evers and Walters, 2001; Evers and Walters, 2000; EPRC, 2007; Kasente, 1997). The gender division of tasks is not limited to cash crop production. The production of food crops as well as the specific tasks in the production of other crops, for example weeding, typically falls into the female domain (Kasente *et al.* 2000; Dolan, 2001). In addition, men exert control over their spouses’ labour to some extent, a tradition also reflected by the practice of paying a bride price (Evers and Walters, 2001). Finally, women bear the burden of housework, which, beyond domestic tasks, comprises a number of time-consuming duties.

In light of the nature of gender relations and the above discussion of intra-household decision-making, it may be instructive to think about two scenarios when considering policy change that leads to higher cash crop, here coffee, prices. First, assume there is no change in intra-household decision-making; then, higher incomes from coffee may result in increased struggles over household resources. By controlling a higher share of household income, male bargaining power might even become stronger, a mechanism that would hence reinforce existing bargaining asymmetries. More income under male control may bias expenditure patterns towards higher consumption of male goods, some of which may even be harmful to other household members’ welfare, such as higher alcohol and tobacco consumption. Moreover, increased male bargaining power could be used to exert pressure on female labour to contribute more labour to cash crop production, thereby squeezing women’s labour time (Elson and Evers, 1996). In extreme cases, more intense bargaining struggles may even cause a higher incidence of domestic violence.

Yet, in a second possible scenario instead of favouring the male position within the household, increased coffee income might increase the importance of the female participation

in the production process, which might raise women's relative bargaining strength and lead household negotiations towards more equitable compensation agreements. Alternatively, other socio-economic changes, especially the increased market participation of farmers as well as the growing importance of non-agricultural income sources in rural areas in Uganda (Kappel *et al.*, 2005), may generally lead to female empowerment and cause a modification of the household allocation rules (Haddad and Reardon, 1993). Together, these different facets of possible change in household decision-making processes would tend to move households towards more cooperative behaviour, thereby increasing the likelihood of efficient bargaining outcomes.

It certainly remains difficult to identify the precise causes of changes in household allocation rules. Yet, it may be less important *why* exactly the rules change, but *whether* they are subject to change. In other words, what matters is whether women are excluded from the benefits coffee income. In the following, we therefore attempt to trace empirically possible changes in Ugandan households' resource allocation rules during a period of remarkable economic transformation and structural change.

Household Survey Evidence from Uganda

Coffee sector deregulation was one of the core pieces of Uganda's economic reform programme of the 1990s.² Overall, coffee sector reforms have been judged successful in a number of studies as they have triggered a considerable supply response, which improved the living standards of coffee farming households (Baffes, 2006; Bussolo *et al.*, 2007). Whether this positive account still holds when coffee sector reforms are assessed from a gender perspective will now be examined drawing upon three survey datasets: the Integrated Household Survey (IHS) of 1992/93, the Uganda National Household Survey (UNHS) of 1999/2000 and the UNHS of 2005/06, which were made available by the Uganda Bureau of Statistics (UBOS). In contrast to most existing studies on gender relations, the use of these relatively comparable datasets allows us to examine behavioural change.

Coffee income is increasingly pooled

Based on these surveys, we examine the effect of the coffee income share on household expenditure over time. If coffee income is indeed controlled by males and we assume that men tend to favour private over public consumption, we expect it to bias

² See the chapters of Reinikka and Collier (2001) for different aspects of the reforms. Further discussions include Dijkstra and van Donge (2001) or Okidi *et al.* (2006). Details on the coffee sector reforms can be found in Akiyama (2001).

expenditure toward male consumption goods. In other words, the following empirical analysis tries to assess whether and to which extend coffee income is being pooled. Similar to Hoddinott and Haddad (1995), we estimate Engel curves for a number of goods following Deaton's (1989, and Deaton *et al.*, 1989) specification, originally introduced by Working (1943):

$$w_i = \frac{P_i q_i}{x} = \alpha + \beta_i \ln\left(\frac{x}{n}\right) + \eta_i \ln(n) + \sum_{j=1}^{J-1} \gamma_{ij} \left(\frac{n_j}{n}\right) + \delta_i z + \lambda_i cof + u_i \quad (1)$$

where total household expenditure is expressed as x and the number of people in the same household as n . w_i is the expenditure share on good i , which is linearly related to the logarithm of the household per capita expenditure (see Deaton and Muellbauer, 1980),

household size (see Working, 1943), and the demographic household composition, $\sum_{j=1}^{J-1} \gamma_{ij} \frac{n_j}{n}$;

that is, the proportion of household members in demographic group j . z simply comprises additional information presumably influencing the overall expenditure pattern, such as the educational level of the head of the household or the "type of community" (Working, 1943: 48). The expenditure functions have been estimated for each survey following Deaton's specification with only minor modifications. According to Appleton *et al.* (1999) we altered the demographic categories and include some additional variables, such as urban, regional, and month dummies, to capture income fluctuations, expenditure seasonality and regional price variations.

The primary variable of interest in the analysis is the household's income share out of coffee production, *cof*. As reported above, while women are greatly involved in the coffee production process (harvesting, seeding, etc.), men dominate selling activities and thus typically control coffee proceeds (EPRC, 2007). These reports are being put to test in a quantitative framework in the following.

To capture the importance of bargaining processes beyond coffee income, we include a dummy capturing male or female 'excess education' while at the same time controlling for the educational level of head and spouse, respectively.³ We test a range of other possible bargaining proxies that could be constructed for all survey years, including, for example, age differences between heads and spouses as well as variables related to women's age at giving birth to their first child. However, given the problems arising in the construction and

³ The male/female 'excess education' variables are dummy variables which equal the value of one for those households having an educational disparity between head and spouse that exceeds a threshold of five years for males and four years for females. In case of polygamous households, the educational level of the wife with the highest educational achievement has been chosen for the calculation. Female-headed household heads are excluded. The sub-sample formation is discussed in more detail below.

qualitative adequacy of these variables,⁴ it is not surprising that these alternative proxies do not yield any further insights and will therefore be disregarded in the following.

Being less concerned with comparability between years, we additionally draw upon particular questions asked in the surveys of 1999/2000 and 2005/06, respectively, to construct more adequate bargaining proxies. For 1999/2000, we use information on the inheritance rules applied in each community, i.e. we know which household or family member typically inherits the parents' (fathers' or mothers') land and other assets.⁵ We aggregate this information by creating dummy variables for communities where rules exclusively favour women or men, respectively. Even more interestingly, the 2005/06 survey asks farmers: "Who mainly manages/controls the output from this parcel among the household members?"⁶ Based on this question, we construct dummy variables indicating whether output (from all parcels of the household) is controlled only by the head or only by the spouse.

We analyse for each survey the budget shares on tobacco and alcohol since these clearly represent male goods. Supposed female expenditure categories include women's and children's clothing. Moreover, the budget share on beef (proxied by the aggregate expenditure share on beef and goat meat) and meat (also including poultry), considered to be male expenditure items, are analysed.

For the sake of homogeneity, we reduced the nation-wide surveys by dropping urban areas and the Northern part of the country.⁷ Based on these geographically reduced samples, we estimate Engel curves using different sub-samples. Obviously, bargaining problems as stated above will not apply to female headed households, households with no female spouse at all and might be altered in a fundamental manner for polygamous households. For coping with these different structures we first drop households not having a spouse and include a female head dummy into the estimation. The second sub-sample then excludes female headed households altogether, while the third leaves only male-headed coffee farmers with a female spouse. Polygamy is taken into account by including a dummy variable for households headed by husbands with multiple spouses. Given the relative robustness of the results across the different sub-samples, we only report the results of the preferred specification that is based on the sample excluding female-headed households and male headed households without a

⁴ For instance, the Ugandan surveys do not allow assigning children to their biological mother.

⁵ In some communities, the community leader decides on inheritance matters.

⁶ It should be noted that information is given only for parcels (27 percent of farm households have one parcel, 34 percent have two parcels, and another 21 percent have three parcels), not for plots or even crops. Maybe somewhat surprisingly, there is quite some variation in control over parcel output. In only about a third of male-headed farms all parcels are controlled only by the head, in a fifth even all parcels mainly by the spouse, and in more than 40 percent of farm households is output controlled/managed jointly.

⁷ The latter region has been shown to suffer from adverse agricultural conditions and to be largely de-linked from the rest of the economy.

female spouse.⁸ Given the great amount of zero observations due to the non-consumption of these goods during the survey we estimate Tobit models. The results are corrected for heteroskedasticity using robust estimates.

Turning to the key variables of interest, Table 1 highlights that the coffee income share impacts positively, and significantly, on the expenditure share of alcohol and negatively on children's and women's wear in the early 1990s, but loses its statistical and lessens its economic power for the subsequent survey years.⁹ This implies that higher proceeds from coffee have not been associated with a disproportionate increase in household expenditure on 'male consumption goods'. Thus, during the 1990s income from coffee appears to have been increasingly pooled.

Table 1: Impact of coffee share and other bargaining power proxies on expenditure patterns, excerpts from Engel-curve estimations

		alcohol	tobacco	children's clothing	women's clothing	meat	beef
1992/93	coffee share	0.0329* (0.018)	-0.0103 (0.019)	-0.00424 (0.0028)	-0.0122** (0.0053)	0.0141 (0.015)	0.00495 (0.015)
	male excess education	0.0102 (0.0078)	0.00483 (0.0076)	-0.00198** (0.00097)	-0.00493*** (0.0019)	-0.000292 (0.0056)	0.00294 (0.0055)
	female excess education	-0.0182 (0.012)	-0.0149 (0.011)	0.00350** (0.0015)	0.0112*** (0.0036)	-0.0136* (0.0075)	-0.0110 (0.0071)
	coffee share	-0.00622 (0.025)	-0.0224 (0.019)	-0.00477* (0.0026)	-0.0116*** (0.0032)	-0.0150 (0.022)	0.00246 (0.023)
	male excess education	0.0104 (0.0085)	0.0146** (0.0062)	-0.000495 (0.00086)	0.000752 (0.0011)	-0.00831 (0.0079)	-0.0110 (0.0082)
2005/06	female excess education	-0.0173 (0.015)	-0.00534 (0.0097)	-0.0000183 (0.0011)	0.000853 (0.0018)	0.00380 (0.012)	-0.0101 (0.012)
	coffee share	-0.0565* (0.034)	-0.00552 (0.019)	-0.00522* (0.0030)	-0.00615 (0.0038)	-0.0438 (0.030)	-0.0218 (0.028)
	male excess education	0.0181* (0.010)	0.0153** (0.0067)	0.0000555 (0.0010)	0.00231* (0.0013)	-0.00192 (0.0074)	0.000553 (0.0069)
	female excess education	-0.0135 (0.017)	-0.00511 (0.0092)	0.00252 (0.0025)	0.00307** (0.0015)	0.0194* (0.012)	0.0183 (0.011)

Source: Authors' calculations.

Notes: Robust standards errors in parentheses.* significant at 10%; ** significant at 5%; *** significant at 1%. Full regression results are reported in Appendices 1-3.

The 'educational excess' variables have the expected sign in most cases and 10 of the 36 coefficients are statistically significant at the 10 percent level. The results can be taken as an indication that relative bargaining power in terms of education does play some role in

⁸ Further restricting the sub-sample to include only monogamous households with children does not affect the results. It should be noted that estimates based on the entire sample – including a female head dummy variable – yield a negative effect of the coffee income share on both women's and children's clothing also for the most recent survey. Although the effects are weaker than in earlier years, this may be taken as indication that men in coffee-farming households are somewhat more powerful in general. The additional regression results can be requested from the authors.

⁹ Full results can be found in Appendices 1-3.

household expenditure decisions.¹⁰ With regard to this variable we do not observe a particular time trend or any indication that the nature of the bargaining process had followed a certain path. Yet, while the polygamy dummy has a negative and significant impact on alcohol and positive impacts upon women’s wear in 1992 and 1999, respectively, it does not exhibit any significant impact upon any expenditure share in 2005 (see Appendix 1-3). This might be interpreted as a sign of cultural change.

Finally, we use the information on control over output in the most recent available survey to examine whether we can detect the supposed pattern of male control over coffee income, which then would be somewhat at odds with increased income pooling. Table 2 shows the shares of farms where parcels are either all managed/controlled by the male head, by the female spouse, or jointly. We find farm households that cultivate coffee to manage/control agricultural output jointly much more frequently than non-coffee farms. We also checked whether this pattern varies with the degree of intercropping, but it does not: even output from almost pure coffee parcels typically appears to be controlled jointly.

Table 2: Control over agricultural output, 2005/06

	Control of output from all farm households' parcels		
	only male head	only female spouse	joint
No coffee	0.38	0.24	0.38
Coffeefarmer	0.33	0.15	0.52
Total	0.36	0.20	0.43

Source: Authors’ calculations.

Notes: The table only considers male-headed households.

Unfortunately, comparable data is not available for earlier years, but the high share of jointly managed/controlled coffee parcels today – taken together with the income pooling results and the wide-spread perception that coffee-income is (or has been) male-controlled – may be interpreted as a sign that production modes have been subject to change.

More cooperation in coffee production?

The above results point towards increasing coffee income pooling since the early 1990s. Consequently, one would expect household members to cooperate better in production, herewith raising production efficiency.

In order to test whether this was actually the case in Uganda, we estimate coffee yield

¹⁰ Both variables constructed from the survey-year-specific information, the ‘gender-biased inheritance rule dummy’ for 1999/2000 and the ‘output control dummy’ for 2005/06, yield similar results.

equations for the years 1999 and 2005.¹¹ Our specification combines Udry's (1996) approach for detecting output inefficiencies due to gendered plot ownership and Lim *et al.*'s (2007) analysis of the importance of female bargaining power on coffee production. Our bargaining proxies are the already introduced male and female 'excess education' variables, the proxy for gender-biased inheritance rules (for 1999/2000) and the dummies for male-head or female-spouse controlled parcels (for 2005/06). It is important to note that the 'educational excess' dummies are somewhat more problematic in the production than in the consumption context since they also reflect relative comparative advantages of individual households members, for example, in non-farm activities vis-à-vis work on the field.

We expect bargaining asymmetries captured by those proxies to lead to less cooperative production behaviour and inefficiencies. In general, production decisions should be taken in accordance with price signals and endowments to achieve efficient allocations. If influenced by bargaining processes, such influence will lead to sub-optimal outcomes.

More specifically, the female power proxy may negatively affect coffee yields since a woman may use her bargaining power to reduce labour input into male-controlled coffee production. However, as suggested by the analysis above, men seem to have lost control over coffee income to a certain extent, which could in principle be interpreted as a change in the compensation for increased female labour input into coffee production. An improvement in the compensation rule in turn ought to render relative bargaining power less important in determining productive resource allocation, thereby increasing production efficiency. The effect of male bargaining power is theoretically ambiguous. Coffee production might benefit from men using their relative strength to force or convince their spouses to contribute to it, nonetheless leading to an inefficient outcome.

As in the previous estimations, we use the geographically reduced sample, which is further restricted to male heads being classified as coffee farmer and having a spouse. The results (reported in Appendix 4) illustrate that coffee output to the area devoted to its production is inversely related to plot size. While the first and second production area sixtiles positively affect output in both years of examination, the last three are associated with output declines although not in a statistically significant manner (with the third sixtile being chosen as reference category). This might be explained by decreasing returns to scale or, alternatively, by phenomena such as rigid cost structures (Udry, 1996). Additional controls include land quality, approximated by the value of the land parcel (per acre), agricultural

¹¹ Unfortunately, the 1992/93 survey does not comprise information about coffee plot size and does not allow for an estimation of yield equations.

assets, the number of male and female prime age adults, a dummy for the application of manure, the coffee area as a share of total cropped area, a dummy for intercropping, and dummies for head's and spouse's educational achievement.

Table 3: The impact of bargaining proxies on coffee yields, excerpts from yield estimations for 1999/2000 and 2005/06

	1999/2000		2005/06	
	Excess education as bargaining proxy	Gender-biased inheritance rules	Excess education as bargaining proxy	Control over output as bargaining proxy
Male more powerful	-57.03 (68.5)	32.08 (68.8)	20.44 (41.0)	-29.64 (29.1)
Female more powerful	-253.7** (104)	-111.0* (59.4)	-140.2** (59.3)	-35.56 (36.1)

Source: Authors' calculations.

Notes: Robust standards errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Full regression results are reported in Appendix.

As shown in Table 3, the static effects of the bargaining proxies correspond to expectations. In all estimations, female bargaining power has a negative effect on coffee yield. The effect of male bargaining power proxies is ambiguous across specifications and years and not significantly different from zero. Between 1999 and 2005, these relationships seem to become slightly weaker. For 2005, it does not make a significant difference in yield when output from the coffee plot is controlled only by the male head or only the female spouse. Yet, coffee production decisions may hence still influenced by bargaining proxies, which can be taken as a sign for the presence of inefficiencies.¹²

These results rest on relatively weak empirical grounds as the number of comparable control variables available in both surveys is limited. In particular, the 1999/2000 survey does not report labour input by plot, a key determinant of agricultural output. The more recent 2005/06 survey allows for a more detailed analysis since it provides information on male, female, child, and hired labour input as well as non-labour input by plot. Furthermore, farmers were asked about the share of intercropped crops while the 1999/2000 survey only ranks the crops according to relative importance. For the year 2005, we can hence estimate an 'augmented' coffee yield equation, the results of which are reported in Appendix 5. Once we control for different types of labour input, quantity of applied manure as well as the intercropped share and the respective intercrop, the effect of neither female nor male

¹² We would not want to put too much emphasis into the strength of the effect between the two years in light of the large variations in the other coefficients, which could for example be due to differences in questionnaire design.

bargaining power proxied by plot control turns out significant.

If control over the proceeds from coffee does not affect coffee yields, intra-household compensation mechanisms seem to allow coffee-farming households to achieve Pareto-efficient allocations. Such a mechanism would for example link plot control to the respective labour contribution. In order to examine this bargaining process more closely, we additionally estimate labour input equations for male, female and child labour. We regress labour input into coffee production on the same set variables as in the yield equation including the plot control dummy. The results (reported in Appendix 5) highlight the gendered nature of agricultural production. While intercropping with female crops, for example root and potato tubers, increases female labour inputs, intercropping with other cash crops, such as cocoa or tea, is associated with higher male labour inputs. As expected, male control over output is associated with higher male and lower female labour input. If output from the plot is controlled by the female, males contribute significantly less labour to this plot. Yet, females do not put significantly more labour effort on plots controlled by them. These findings show that output control and labour input are indeed linked. While the ‘augmented’ coffee yield equation from above suggests no influence of bargaining processes on coffee yields, and hence Pareto-efficiency, the asymmetries between male and female-controlled plots point towards inefficiencies in the compensation mechanism. A final judgement on whether these results reflect an efficient compensation mechanism has to be left to future research.

Taken together, the results on coffee production suggest bargaining processes, in particular over labour allocation, may still undermine production efficiency. Yet, in the most recent survey, we find no significant impact of bargaining proxies in the ‘augmented’ yield equation for the most recent survey and, as indicated above, control over coffee output is on average more equally distributed between husband and wife than control of other crops. The empirical analysis hence also gives some hints at more cooperative household behaviour in coffee production.

Conclusion

This paper analyses the impact of coffee market liberalisation from a gender perspective in Uganda between 1992 and 2006. The estimation of Engel curves including the coffee income share as male bargaining proxy reveals that income has been increasingly pooled. Hence, in the Ugandan context higher proceeds from coffee did not increase male welfare disproportionately, but appear to have been shared more equally among household members. Increased pooling of coffee income should be reflected in more cooperative

behaviour in production. Unfortunately, the data at hand may be too imperfect to arrive at a firm conclusion in this regard. Yet, the detailed analysis of coffee production for the most recent survey suggests that rigid gender roles and struggles over resources persist in the Ugandan agricultural context. These phenomena can be an obstacle to increasing agricultural efficiency, especially in the cash crop sector. Yet, given the strong public as well as academic perception of coffee as a “male crop”, our results may also be taken as an indication that households might have moved towards more efficient compensation rules.

Overall, the opportunities created by liberalised markets and a growing economy appear to have provided incentives for households to move towards more cooperative consumption behaviour or has, at least, altered their consumption allocation rules. However, it is likely that coffee market liberalisation alone plays only a minor role in explaining behavioural change as it is deeply embedded in the cultural and social structure of Uganda. This becomes particularly apparent in our analysis of household production processes. Therefore, one has to be prudent about drawing general conclusions from the Ugandan case, but there is no a priori proposition that cash crop liberalisation leads to a strengthening of existing bargaining asymmetries.

References

- Akiyama, T. (2001) Coffee Market Liberalization since 1990, in: T. Akiyama, J. Baffes, D.F. Larson, and P. Varangis (eds), *Commodity Market Reforms: Lessons of Two Decades*, (The World Bank: Washington, DC.).
- Alderman, H., Haddad, L. and Hoddinott, J. (1997) *Intrahousehold Resource Allocation in Developing Countries: Models, Methods, and Policies*, (Baltimore and London: Johns Hopkins University Press).
- Alderman, H., Chiappori, P.-A. Haddad, L. Hoddinott, J. and Kanbur, R. (1995) Unitary versus Collective Models of the Household: Is It Time to Shift the Burden of Proof? *The World Bank Research Observer* 10(1), pp. 1-19.
- Appleton, S., Chessa, I. and Hoddinott, J. (1999) Are women the fairer sex? Looking for gender differences in gender bias in Uganda. Mimeo, University of Oxford.
- Baden, S. (1993) Gender and adjustment in Sub-Saharan Africa. *BRIDGE Report* No. 8 (Brighton: Institute of Development Studies).
- Baffes, J. (2006) Restructuring Uganda's Coffee Industry: Why Going Back to Basics Matters. *Development Policy Review* 24 (4), 413–436.
- Bantebya, G. and Keniston, M. (2006) *Women, Work and Domestic Virtue in Uganda 1900-2003* (Oxford: James Currey Ltd).
- Becker, G. (1974) A Theory of Marriage: Part II. *The Journal of Political Economy*, 82(2), pp. 11-26.
- Berik, G., van der Meulen Rodgers, Y. and Zveglic Jr., J. (2004) International Trade and Gender Wage Discrimination: Evidence from East Asia. *Review of Development Economics*, 8(2), pp. 237-254.
- Bourguignon, F., Browning, M., Chiappori, P.-A. and Lechene, V. (1993) Intra Household Allocation of Consumption: A Model and Some Evidence from French Data.. *Annales d'Economie et de Statistique*, pp. 137-156.
- Bourguignon, F., Browning, M., Chiappori, P.-A. and Lechene, V. (1994) "Income and Outcomes: A Structural Model of Intrahousehold Allocation", *The Journal of Political Economy*, 102(6): 1067-1096
- Browning, M., Chiappori, P.-A. and Lechene, V. (2006) Collective and Unitary Models: A Clarification. *Review of Economics of the Household* 4, pp. 5-14.
- Browning, M. and Chiappori, P.A. (1998) Efficient Intra-Household Allocations: A General Characterization and Empirical Tests. *Econometrica*, 66(6):1241-1278
- Bussolo, M., Godart, O., Lay, J. and Thiele, R. (2006) The Impact of Commodity Price Changes on Rural Households: The Case of Coffee in Uganda. *Agricultural Economics*, 37 (2-3), pp. 293-303.
- Carter, M., and Katz, E. (1997) Separate spheres and the conjugal contract: Understanding the impact of gender-biased development, in H. Alderman, L. Haddad and J. Hoddinott (eds), *Intrahousehold resource allocation: Policy issues and research methods*. Baltimore and London: Johns Hopkins University Press.
- Chiappori, P.A. (1992) Collective" Models of Household Behavior: The Sharing Rule Approach. *DELTA Working Papers* 92-02, DELTA.
- Deaton, A. (1989) Looking for Boy-Girl Discrimination in Household Expenditure Data. *The World Bank Economic Review*, 3(1), pp. 1-15.
- Deaton, A. and Muellbauer, J. (1980) *Economics and Consumer Behaviour* (Cambridge: Cambridge University Press).

- Deaton, A., Ruiz-Castillo, J. and Thomas, D. (1989) The Influence of Household Composition on Household Expenditure Patterns: Theory and Spanish Evidence. *The Journal of Political Economy*, 97(1), pp. 179-200.
- Dolan, C. (2001) The 'Good Wife': Struggles over Resources in the Kenyan Horticultural Sector. *Journal of Development Studies*, 37(3), pp. 39 – 70.
- Dijkstra, A. and van Donge, J., 2001 What Does the "Show Case" Show? Evidence of and Lessons from Adjustment in Uganda. *World Development* 29(5), 841-863.
- Duflo, E. and Udry, C. (2004) Intrahousehold Resource Allocation in Cote d'Ivoire: Social Norms, Separate Accounts and Consumption Choices. *NBER Working Papers* 10498, National Bureau of Economic Research.
- Economic Policy Research Centre (EPRC) (2007) International Trade and Gender in East Africa – The Ugandan Case Study. Mimeo, EPRC, Kampala.
- Elson, D. and Evers, B. (1996) Uganda: Gender Aware Country Strategy Report. Mimeo, The University of Manchester, Manchester.
- Evers, B. and Walters, B. (2000) Extra-Household Factors and Women Farmers' Supply Response in Sub-Saharan Africa. *World Development*, 28(7), pp. 1341-1345.
- Evers, B. and Walters, B. (2001) The Model of a Gender-Segregated Low-Income Economy Reconsidered: Evidence from Uganda. *Review of Development Economics*, 5(1), pp. 76-88.
- Ghiara, R. (1999) Impact of Trade Liberalisation on Female Wages in Mexico: An Econometric Analysis. *Development Policy Review*, 17, pp. 171-190.
- Haddad, L. and Reardon, T. (1993) Gender bias in the allocation of resources within households in Burkina Faso: a disaggregated outlay equivalent analysis. *Journal of Development Studies*, 29 (2), pp. 260-276.
- Haddad, L. and Hoddinott, J. (1995) Does Female Income Share influence Household Expenditures? Evidence from Cote D'Ivoire. *Oxford Bulletin of Economics and Statistics*, 57 (1), pp. 77-96.
- Jones, C. (1983) The Mobilization of Women's Labor for Cash Crop Production: A Game Theoretic Approach. *American Journal of Agricultural Economics*, 65(5):1049-1054.
- Kappel, R., Lay, J. and Steiner, S. (2005) Uganda: No More Pro-Poor Growth? *Development Policy Review* 23 (1), pp. 27-53.
- Kasente, D. (1997) Agricultural Intensification Strategies, Women's Workloads and Well-being in Uganda, prepared for the UNRISD/UNDP/CDS Workshop on Gender, Poverty and Well-being, 24th-27th November 1997.
- Kasente, D., Lockwood, M., Vivian, J. and Whitehead, A. (2000) Gender and the Expansion of Non-traditional Agricultural Exports in Uganda. UNRISD Occasional Paper No. 12 .
- Lim, S., Winter-Nelson, A. and Arends-Kuenning, M. (2007). Household Bargaining Power and Agricultural Supply Response: Evidence from Ethiopian Coffee Growers. *World Development*, 35(7), pp. 1204–1220.
- Newman, C. (2002) Gender, Time Use, and Change: The Impact of the Cut Flower Industry in Ecuador. *World Bank Economic Review* 16(3), pp. 375-96.
- Nicita, A. and Razzaz, S. (2003) Who Benefits and How Much? How Gender Affects Welfare Impacts of a Booming Textile Industry in Madagascar. *World Bank Policy Research Working Paper* 3029, The World Bank, Washington D.C.
- Okidi, J., Ssewanyana, S., Bategeka, L. and F. Muhumuza (2006) Uganda's Experience with 'Operationalizing Pro-Poor Growth', 1992 to 2003, in: T. Besley and L. Cord (eds), *Delivering on the Promise of Pro-Poor Growth* (The World Bank: Palgrave).

- Paul-Majumder, P. and Begum, A. (2000) The Gender Imbalances in the Export Oriented Garment Industry in Bangladesh. *World Bank Policy Research Report on Gender and Development*, Working Paper Series 12 (Washington, D.C.: The World Bank).
- Quisumbing, A.R. and Maluccio, J.A. (2003) Resources at Marriage and Intrahousehold Allocation: Evidence from Bangladesh, Ethiopia, Indonesia, and South Africa. *Oxford Bulletin of Economics and Statistics*, 65(3), pp. 283-328.
- Reinikka, R. and Collier, P. (eds) (2001) *Uganda's recovery. The role of firms, farms, and government* (Washington D.C.: World Bank).
- Seebens, H. and Sauer, J. (2007) "Bargaining Power and Efficiency – Rural Households in Ethiopia", *Journal of International Development*, 19: 895-918
- Seguino, S. (2000) The Effects of Structural Change and Economic Liberalisation on Gender Wage Differentials in South Korea and Taiwan. *Cambridge Journal of Economics*, 24(4), pp. 437-459.
- Silberschmidt, M. (2001) Disempowerment of Men in Rural and Urban East Africa: Implications for Male Identity and Sexual Behavior. *World Development*, 29(4), pp. 657-671.
- Smith, L.C. and Chavas, J. (1999) Supply response of West African agricultural households: Implications of intrahousehold preference heterogeneity. *FCND Discussion Paper 69*, International Food Policy Research Institute.
- Thomas, D. and Chen, C.-L. (1994) Income Shares and Shares of Income: Empirical Tests of Models of Household Resource Allocations. *RAND Labor and Population Program Working Paper Series 94-08*
- Udry, C. (1996) Gender, Agricultural Production, and the Theory of the Household. *The Journal of Political Economy*, 104 (5), pp. 1010-1046.
- Ulph, D. (1988) A General Non-Cooperative Nash Model of Household Consumption Behaviour. Mimeo, University of Bristol, cited in L. Haddad, and J. Hoddinott (1995).
- Wood, A. (1991) North-South Trade and Female Labour Manufacturing: An Asymmetry. *Journal of Development Studies*, 27(2), pp. 168-189.
- World Bank (2005) Uganda: From Periphery to Center – A Strategic Country Gender Assessment. Report No. 30136-UG. Washington D.C.
- Working, H. (1943) Statistical Laws of Family Expenditure. *Journal of the American Statistical Association*, 38, pp. 43-56.

Appendices

Appendix 1: Engel-curve estimates for 1992/93

	alcohol	tobacco	children's clothing	women's clothing	meat	beef
log per capita expenditure	0.00871* (0.0045)	0.00250 (0.0038)	-0.0000174 (0.00058)	-0.00219* (0.0013)	0.0257*** (0.0034)	0.0221*** (0.0033)
log household size	0.00120 (0.0075)	-0.00740 (0.0059)	0.00468*** (0.00100)	-0.00716*** (0.0018)	0.00874 (0.0055)	0.00824 (0.0057)
<i>coffee share</i>	0.0329* (0.018)	-0.0103 (0.019)	-0.00424 (0.0028)	-0.0122** (0.0053)	0.0141 (0.015)	0.00495 (0.015)
male excess education	0.0102 (0.0078)	0.00483 (0.0076)	-0.00198** (0.00097)	-0.00493*** (0.0019)	-0.000292 (0.0056)	0.00294 (0.0055)
female excess education	-0.0182 (0.012)	-0.0149 (0.011)	0.00350** (0.0015)	0.0112*** (0.0036)	-0.0136* (0.0075)	-0.0110 (0.0071)
share of fem. children 0-5	0.00726 (0.029)	-0.00252 (0.020)	0.0294*** (0.0038)	-0.000690 (0.0064)	-0.00812 (0.020)	-0.00634 (0.020)
share of fem. children 6-14	0.0254 (0.027)	-0.00807 (0.023)	0.0278*** (0.0041)	0.00140 (0.0075)	0.00312 (0.021)	-0.00794 (0.022)
share of male children 0-5	0.0144 (0.028)	-0.0189 (0.020)	0.0304*** (0.0040)	0.00152 (0.0068)	-0.0172 (0.021)	-0.0152 (0.020)
share of male children 6-14	0.0572** (0.029)	-0.0135 (0.022)	0.0194*** (0.0041)	-0.00811 (0.0069)	-0.0102 (0.022)	-0.0127 (0.023)
share of male adults 15 plus	0.0624 (0.040)	-0.00857 (0.026)	0.00996* (0.0054)	-0.0120 (0.0083)	-0.0340 (0.025)	-0.0237 (0.025)
polygamous household	-0.0308*** (0.010)	-0.00165 (0.010)	-0.000226 (0.0013)	0.0154*** (0.0031)	-0.0136** (0.0067)	-0.00510 (0.0064)
head completed primary	-0.00724 (0.0061)	-0.0269*** (0.0060)	0.00277*** (0.00070)	0.00541*** (0.0016)	0.00554 (0.0043)	0.00454 (0.0042)
head completed secondary or higher	-0.000114 (0.0090)	-0.0416*** (0.0100)	0.00471*** (0.0011)	0.0135*** (0.0024)	0.00100 (0.0063)	-0.00893 (0.0061)
spouse completed primary	-0.0148** (0.0066)	0.00226 (0.0059)	0.0000193 (0.00073)	0.000909 (0.0016)	0.00506 (0.0045)	0.00522 (0.0042)
spouse completed secondary or higher	-0.0387*** (0.015)	-0.00856 (0.014)	-0.00131 (0.0015)	0.00148 (0.0039)	0.00116 (0.0089)	0.00298 (0.0083)
cofstrat	-0.0327*** (0.0080)	0.00211 (0.0062)	-0.000679 (0.00089)	0.00165 (0.0018)	0.00851 (0.0069)	0.0286*** (0.0069)
share of cash income	-0.0139 (0.013)	-0.0291** (0.012)	0.00270* (0.0015)	0.00852** (0.0035)	0.0257*** (0.0095)	0.0274*** (0.0091)
non-agricultural share	0.00681 (0.014)	0.0319** (0.013)	-0.000127 (0.0017)	-0.00512 (0.0036)	-0.00716 (0.011)	-0.00599 (0.010)
other cash crops share	0.0459 (0.029)	0.0298 (0.034)	-0.00113 (0.0068)	0.00832 (0.0087)	-0.00761 (0.025)	0.0125 (0.022)
regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
months dummies	Yes	Yes	Yes	Yes	Yes	Yes
constant and selection term	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2783	2783	2783	2783	2783	2783

Source: Authors' calculations.

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Appendix 2: Engel-curve estimates for 1999/2000

	(1)	(2)	(3)	(4)	(5)	(6)
	alcohol	tobacco	children's clothing	women's clothing	meat	beef
log per capita expenditure	0.0321*** (0.0048)	0.00737** (0.0034)	0.00158*** (0.00055)	0.00204** (0.00079)	0.0793*** (0.0045)	0.0716*** (0.0043)
log household size	-0.00816 (0.0066)	-0.00637 (0.0048)	0.00801*** (0.00077)	-0.00360*** (0.0011)	0.0187*** (0.0067)	0.0196*** (0.0067)
<i>coffee share</i>	-0.00622 (0.025)	-0.0224 (0.019)	-0.00477* (0.0026)	-0.0116*** (0.0032)	-0.0150 (0.022)	0.00246 (0.023)
male excess education	0.0104 (0.0085)	0.0146** (0.0062)	-0.000495 (0.00086)	0.000752 (0.0011)	-0.00831 (0.0079)	-0.0110 (0.0082)
female excess education	-0.0173 (0.015)	-0.00534 (0.0097)	-0.0000183 (0.0011)	0.000853 (0.0018)	0.00380 (0.012)	-0.0101 (0.012)
share of fem. children 0-5	-0.0223 (0.029)	-0.0135 (0.020)	0.0169*** (0.0032)	-0.00459 (0.0042)	0.0902*** (0.029)	0.0539* (0.030)
share of fem. children 6-14	0.00599 (0.028)	-0.0265 (0.019)	0.00972*** (0.0032)	-0.0127*** (0.0045)	0.0431 (0.031)	0.0336 (0.030)
share of male children 0-5	-0.0346 (0.029)	-0.0382* (0.020)	0.0138*** (0.0033)	-0.00967** (0.0044)	0.0736** (0.030)	0.0579* (0.030)
share of male children 6-14	-0.000717 (0.030)	-0.0195 (0.020)	0.00477 (0.0033)	-0.0214*** (0.0046)	0.0454 (0.029)	0.0339 (0.029)
share of male adults 15 plus	-0.0382 (0.035)	-0.00743 (0.023)	0.00391 (0.0045)	-0.0238*** (0.0052)	-0.0509 (0.037)	-0.0396 (0.038)
polygamous household	-0.0272* (0.014)	-0.0117 (0.0097)	-0.00419*** (0.0014)	0.00512** (0.0020)	0.00497 (0.012)	0.0122 (0.012)
head completed primary	-0.00804 (0.0064)	-0.0157*** (0.0050)	0.00265*** (0.00061)	0.0000548 (0.00083)	0.00998* (0.0056)	0.00657 (0.0059)
head completed secondary or higher	-0.00845 (0.011)	-0.0277*** (0.0080)	0.00348*** (0.00100)	0.00194 (0.0014)	0.00265 (0.0089)	0.00221 (0.0089)
spouse completed primary	-0.0147** (0.0071)	-0.00194 (0.0051)	0.000629 (0.00063)	0.00132* (0.00080)	-0.00217 (0.0059)	0.00583 (0.0060)
spouse completed secondary or higher	-0.0211 (0.015)	-0.00450 (0.011)	0.00291** (0.0014)	0.00366* (0.0021)	-0.0122 (0.010)	0.000186 (0.011)
cofstrat	-0.0415*** (0.0082)	0.00673 (0.0049)	0.000406 (0.00067)	0.00130 (0.00092)	-0.0276*** (0.0069)	-0.0154** (0.0069)
share of cash income	-0.0217 (0.018)	-0.0185 (0.013)	0.00842*** (0.0017)	0.0141*** (0.0023)	0.0497*** (0.016)	0.0465*** (0.017)
non-agricultural share	-0.00241 (0.018)	0.000491 (0.013)	-0.00290 (0.0018)	-0.00255 (0.0024)	-0.00246 (0.015)	0.00522 (0.016)
other cash crops share	-0.148** (0.062)	0.0290 (0.035)	-0.00749 (0.0054)	-0.000647 (0.0075)	0.0852 (0.058)	0.0650 (0.056)
regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
months dummies	Yes	Yes	Yes	Yes	Yes	Yes
constant and selection term	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4061	4061	4061	4061	4061	4061

Notes: Robust standard errors in parentheses. Month dummies omitted.

* significant at 10%; ** significant at 5%; *** significant at 1%

Source: Authors' calculations.

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Month dummies omitted.

Appendix 3: Engel-curve estimates for 2005/06

	alcohol	tobacco	children's clothing	women's clothing	meat	beef
log per capita expenditure	0.0128** (0.0063)	-0.00417 (0.0034)	0.00135** (0.00063)	0.000279 (0.00065)	0.0579*** (0.0049)	0.0494*** (0.0044)
log household size	-0.00855 (0.0095)	-0.00281 (0.0050)	0.00511*** (0.00091)	-0.00306*** (0.0011)	0.0220*** (0.0066)	0.0197*** (0.0062)
<i>coffee share</i>	-0.0565* (0.034)	-0.00552 (0.019)	-0.00522* (0.0030)	-0.00615 (0.0038)	-0.0438 (0.030)	-0.0218 (0.028)
male excess education	0.0181* (0.010)	0.0153** (0.0067)	0.0000555 (0.0010)	0.00231* (0.0013)	-0.00192 (0.0074)	0.000553 (0.0069)
female excess education	-0.0135 (0.017)	-0.00511 (0.0092)	0.00252 (0.0025)	0.00307** (0.0015)	0.0194* (0.012)	0.0183 (0.011)
share of fem. children 0-5	-0.0612 (0.040)	-0.0156 (0.022)	0.0184*** (0.0040)	-0.00527 (0.0039)	0.0850*** (0.027)	0.0598** (0.025)
share of fem. children 6-14	-0.0437 (0.039)	-0.00894 (0.024)	0.0123*** (0.0035)	-0.00858** (0.0040)	0.0589** (0.027)	0.0594** (0.026)
share of male children 0-5	-0.110*** (0.037)	-0.0328 (0.023)	0.0139*** (0.0036)	-0.00118 (0.0040)	0.0592** (0.027)	0.0287 (0.025)
share of male children 6-14	-0.0711* (0.039)	-0.0198 (0.021)	0.0107*** (0.0036)	-0.0124*** (0.0038)	0.0234 (0.027)	0.00795 (0.025)
share of male adults 15 plus	-0.115** (0.048)	0.0158 (0.026)	-0.000357 (0.0042)	-0.0122** (0.0048)	0.0326 (0.033)	0.0328 (0.031)
polygamous household	0.0000669 (0.016)	-0.00547 (0.0095)	-0.00205 (0.0014)	0.00295 (0.0018)	0.000393 (0.012)	0.00260 (0.011)
head completed primary	-0.00491 (0.0073)	-0.0235*** (0.0050)	0.00214*** (0.00065)	0.00159* (0.00088)	0.0125** (0.0055)	0.00777 (0.0051)
head completed secondary or higher	-0.0244* (0.013)	-0.0296*** (0.0078)	0.00439*** (0.0010)	0.00168 (0.0013)	0.00284 (0.0080)	-0.00356 (0.0079)
spouse completed primary	-0.0107 (0.0076)	-0.00552 (0.0051)	0.00121* (0.00070)	0.00310*** (0.00096)	-0.0161*** (0.0056)	-0.00678 (0.0053)
spouse completed secondary or higher	-0.0423*** (0.016)	0.000363 (0.0089)	0.00343* (0.0019)	0.00685*** (0.0018)	-0.0135 (0.0091)	-0.00677 (0.0086)
cofstrat	-0.0000122 (0.0082)	-0.00910** (0.0046)	0.000814 (0.00074)	0.000173 (0.00087)	0.00370 (0.0058)	0.0103* (0.0055)
share of cash income	-0.00146 (0.020)	-0.0210* (0.011)	0.000693 (0.0015)	0.00513** (0.0022)	0.0458*** (0.014)	0.0377*** (0.013)
non-agricultural share	-0.0175 (0.018)	0.00262 (0.011)	-0.000270 (0.0014)	-0.00156 (0.0019)	-0.0278** (0.013)	-0.0115 (0.012)
other cash crops share	-0.0701 (0.052)	-0.0224 (0.035)	-0.00861* (0.0049)	-0.0123 (0.0078)	-0.0199 (0.041)	0.00130 (0.035)
regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
months dummies	Yes	Yes	Yes	Yes	Yes	Yes
constant and selection term	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2684	2684	2684	2684	2684	2684

Source: Authors' calculations.

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Month dummies omitted.

Appendix 4: Comparable coffee yield estimations for 1999/2000 and 2005/06

	1999/2000		2005/06	
	Excess education as bargaining proxy	Gender-biased inheritance rules	Excess education as bargaining proxy	Control over output as bargaining proxy
Head completed primary	14.89 (55.1)	38.36 (49.5)	-19.69 (33.8)	3.119 (28.7)
Head completed secondary or higher	47.06 (83.3)	49.39 (69.0)	-42.22 (50.2)	-18.09 (39.4)
Spouse completed primary	95.87 (61.9)	63.26 (55.3)	43.93 (37.8)	28.62 (34.3)
Spouse completed secondary or higher	-68.34 (93.6)	-93.05 (83.9)	75.36 (62.9)	44.59 (54.4)
Experience	0.749 (1.21)	0.317 (1.23)	-1.068 (0.80)	-0.863 (0.91)
Male adults	-0.863 (25.5)	4.210 (28.4)	30.44* (16.1)	32.30* (16.6)
Female adults	38.85 (28.7)	29.27 (29.6)	-3.220 (13.8)	-3.489 (14.1)
Area under coffee sextile 1	279.2** (108)	299.2*** (107)	198.3*** (53.4)	213.8*** (56.7)
Area under coffee sextile 2	50.79 (102)	66.16 (102)	106.4** (44.1)	110.2** (44.9)
Area under coffee sextile 4	-129.2 (93.7)	-129.8 (92.8)	8.785 (41.5)	14.78 (42.9)
Area under coffee sextile 5	-144.7 (102)	-132.5 (101)	-53.13 (37.1)	-33.40 (40.1)
Area under coffee sextile 6	-192.3* (101)	-181.1* (101)	13.00 (48.0)	17.41 (49.6)
Land quality	5.921 (6.70)	7.788 (6.97)	16.62*** (4.33)	18.28*** (4.45)
Agricultural asset quartile 2	117.6 (98.1)	107.6 (97.9)	27.86 (39.8)	39.58 (39.0)
Agricultural asset quartile 3	159.0* (95.7)	146.5 (94.9)	94.76*** (36.0)	97.30*** (37.1)
Agricultural asset quartile 4	157.2 (97.8)	162.9* (97.5)	78.49* (41.4)	70.45 (43.0)
Coffee area as share of total cropped area	-404.5*** (111)	-419.1*** (113)	-110.2** (49.1)	-124.0** (50.9)
Plot intercropped	-13.73 (41.4)	-17.47 (41.7)	-139.2*** (47.0)	-136.4*** (47.1)
Manure applied	99.72 (71.8)	94.23 (72.8)	10.75 (32.2)	23.07 (37.5)
<i>Male more powerful</i>	-57.03 (68.5)	32.08 (68.8)	20.44 (41.0)	-29.64 (29.1)
<i>Female more powerful</i>	-253.7** (104)	-111.0* (59.4)	-140.2** (59.3)	-35.56 (36.1)
Constant	451.6*** (157)	463.4*** (155)	258.8*** (77.1)	243.3*** (75.3)
Observations	931	933	926	928
R-squared	0.14	0.14	0.13	0.13

Source: Authors' calculations.

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Agricultural assets in 2005/06 include a broader class of assets.

Appendix 5: Augmented yield equation for 2005/06

Head completed primary	-0.383 (28.7)		
Head completed secondary	4.643 (42.9)	Agricultural asset quartile 4	119.0*** (43.7)
Head completed higher	-48.07 (72.0)	Manure in kg	0.00676 (0.017)
Spouse completed primary	49.78 (32.5)	Coffee area a. sh. of total cropped area	-159.0*** (50.0)
Spouse completed secondary or higher	55.18 (54.9)	Plot intercropped	-41.20 (49.5)
Male labour	0.438 (0.27)	Share intercropped with grains	-385.0*** (95.0)
Female labour	0.383* (0.23)	Share intercropped with beans or peas	-274.6*** (95.5)
Child labour	-0.446*** (0.17)	Share intercropped with other legumes	-293.5* (174)
Hired labour	-0.00581 (0.15)	Share intercropped with vegetables	-489.7** (203)
Area under coffee sextile 1	210.0*** (69.9)	Share intercropped with cotton/tobacco	-340.7 (304)
Area under coffee sextile 2	98.62* (58.4)	Share intercropped with potato tubers	-281.5* (170)
Area under coffee sextile 4	-17.94 (57.3)	Share intercropped with root tubers	-382.5*** (109)
Area under coffee sextile 5	-77.46 (53.1)	Share intercropped with tree fruits	-21.37 (286)
Area under coffee sextile 6	-39.49 (62.0)	Share intercropped with matoke	-291.5 (291)
Land quality	17.54*** (4.50)	Share intercropped with sweet banana	-714.4** (310)
Agricultural asset quartile 2	48.66 (41.6)	Share intercropped with tea/cocoa	-585.4 (357)
Agricultural asset quartile 3	112.8*** (37.7)	Share intercropped with other plants	-411.4 (252)
<i>Male more powerful</i>	-45.14 (30.1)		
<i>Female more powerful</i>	-16.36 (37.1)		
Constant	381.8*** (89.0)		
Observations	927		
R-squared	0.17		

Source: Authors' calculations.

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Appendix 6: Labour input equations

	Labour input per acre		
	male	child	female
Male adults	1.504 (1.95)		
Children between 6 and 14		4.526*** (0.76)	
Female adults			4.706 (3.65)
Head completed primary	-0.807 (4.23)	5.740 (3.49)	5.062 (8.04)
Head completed secondary	8.541 (7.41)	7.669 (5.04)	12.34 (12.1)
Head completed higher	1.323 (12.8)	41.37*** (14.7)	24.83 (19.5)
Spouse completed primary	-15.73*** (4.15)	-10.42*** (3.55)	-19.49** (8.13)
Spouse completed secondary or higher	-17.90*** (6.43)	-12.13* (6.19)	-41.24*** (14.5)
Area under coffee sextile 1	36.71*** (9.52)	12.71 (8.63)	151.8*** (18.2)
Area under coffee sextile 2	7.369 (7.57)	3.422 (7.58)	33.57*** (12.1)
Area under coffee sextile 4	-15.10** (7.19)	-5.876 (7.31)	-20.06 (13.0)
Area under coffee sextile 5	-23.35*** (7.20)	-2.916 (7.68)	-33.29*** (11.7)
Area under coffee sextile 6	-38.20*** (6.93)	-12.20 (7.75)	-57.26*** (13.1)
Coffee area as share of total cropped area	-25.87*** (7.75)	-19.34*** (5.47)	-52.46*** (13.4)
Plot intercropped	-9.501 (7.84)	0.180 (5.13)	2.086 (15.3)
Share intercropped with grains	73.92*** (16.0)	37.43*** (12.4)	136.4*** (31.3)
Share intercropped with beans or peas	31.05** (14.0)	28.06** (10.9)	107.7*** (25.6)
Share intercropped with other legumes	69.59*** (26.7)	20.08 (24.0)	324.3*** (77.2)
Share intercropped with vegetables	43.81 (37.3)	42.58*** (15.4)	58.85 (40.1)
Share intercropped with cotton/tobacco	193.9*** (74.5)	82.92** (40.6)	169.5** (80.6)
Share intercropped with potato tubers	56.11** (27.5)	38.02 (26.4)	252.6*** (61.6)
Share intercropped with root tubers	25.73 (18.9)	28.32** (14.1)	128.1*** (34.4)
Share intercropped with tree fruits	154.3*** (55.9)	3.364 (31.5)	39.66 (73.8)
Share intercropped with matoke	-124.7** (54.6)	0.143 (30.8)	-18.22 (74.3)
Share intercropped with sweet banana	-195.1*** (62.9)	25.01 (44.9)	-88.11 (83.0)
Share intercropped with tea/cocoa	108.9* (57.7)	13.78 (27.1)	92.07 (57.1)
Share intercropped with other plants	22.57 (31.6)	31.98 (24.3)	96.83** (48.4)
<i>Output controlled by male head</i>	12.99*** (4.57)	-1.021 (3.35)	-18.93** (7.92)
<i>Output controlled by female spouse</i>	-34.20*** (5.33)	0.924 (4.59)	13.28 (10.4)
Constant	57.04*** (10.2)	6.159 (9.37)	61.73*** (21.1)
Observations	912	921	916
R-squared	0.27	0.15	0.42

Source: Authors' calculations.

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.