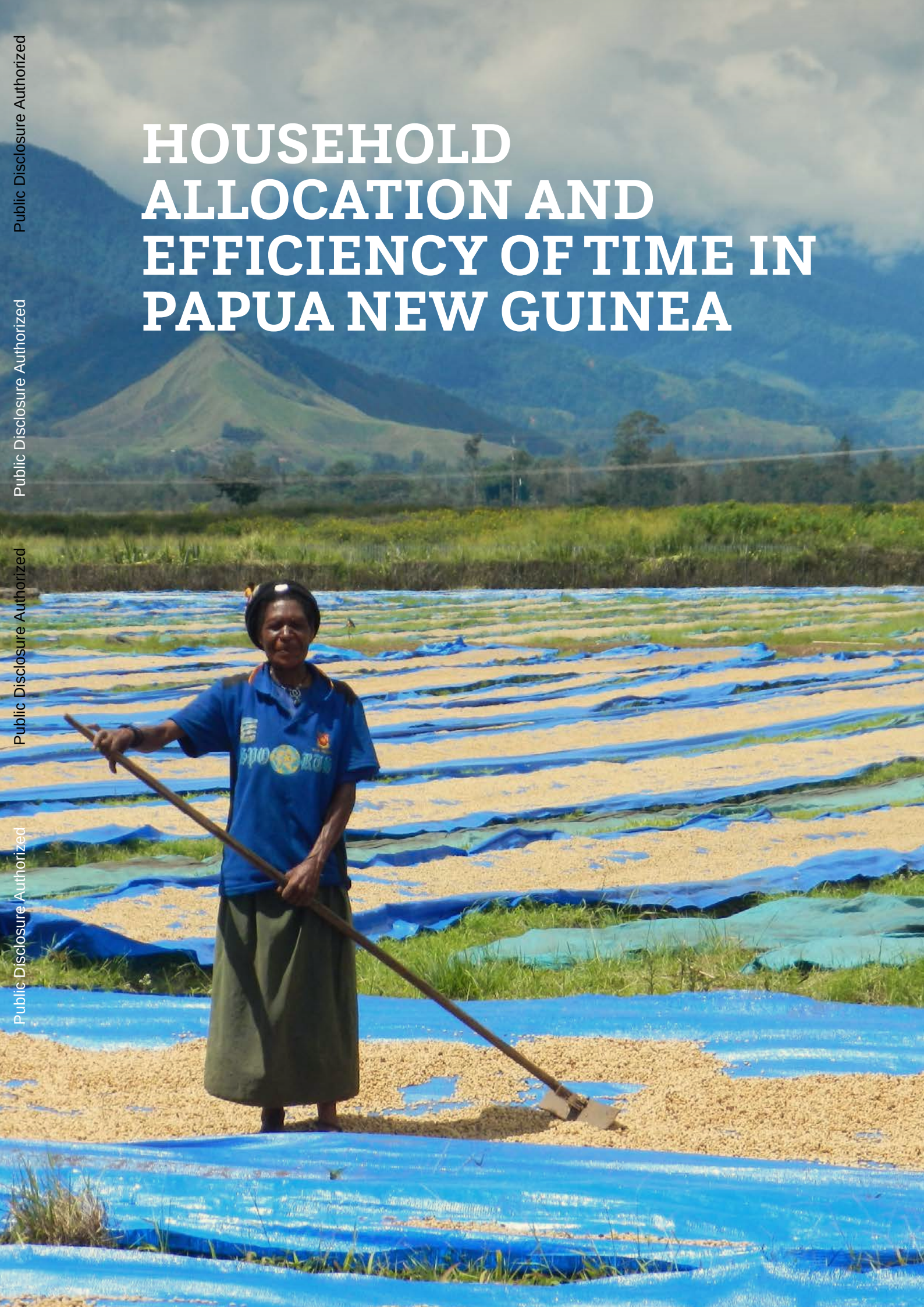
HOUSEHOLD ALLOCATION AND EFFICIENCY OF TIME IN PAPUA NEW GUINEA



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ABSTRACT

In Papua New Guinea, the only study to provide estimates of men's and women's time-use dates from the late 1990s and relies on data collected in 1992-93.

An analysis of tasks undertaken by men and women, including domestic work, is useful to obtain a more complete picture of the labor uses of men and women.

Towards this end The Household Allocation and Efficiency of Time in Papua New Guinea Report provides new insights on the gender division of labor in the agricultural sector in Papua New Guinea.

This report looks at how gender-differentiated domestic work burdens impact the ability of women to allocate their labor to the cultivation, harvesting and processing of coffee and cocoa.

The report identifies gender-disaggregated trends in time allocation and links these patterns to household welfare outcomes. The note also outlines recommendations to improve outcomes for women in Papua New Guinea within these two sectors.

Photo: Thomas Perry/World Bank.

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ABBREVIATIONS

ACIAR	Australian Centre for International Agricultural Research
ARB	Autonomous Region of Bougainville
CPB	Cocoa Pod Borer
DFAT	Department of Foreign Affairs and Trade
ENB	East New Britain Province
PGK	Papua New Guinea Kina
PNG	Papua New Guinea
PPAP	Productive Partnership in Agriculture Project

Photo: Thomas Perry/World Bank.

GLOSSARY

Agreement index	Composite indicator using agreement variables (partners agree on various topics) as primary indicators.
Asset wealth index	Composite indicator using household assets and housing characteristics as primary indicators.
Composite index	Linear combination of categorical data obtained from a multiple correspondence analysis or a factor analysis. Built this way, the composite indicator can be considered as the best regressed latent variable on K primary indicators, since no other explanatory variable is more informative.
Family problem index	Composite indicator using family problem variables (problems in family in the last two years) as primary indicators.
Female decision index	Composite indicator using female decision variables (decisions on various issues concerning the family) as primary indicators.
Male decision index	Composite indicator using male decision variables (decisions on various issues concerning the family) as primary indicators.
Permission index	Composite indicator using permission variables (ask permission to her/his partner to go to various places) as primary indicators.

Photo: Thomas Perry/World Bank.

EXECUTIVE SUMMARY

I. OBJECTIVE

The objective of this time-use and gender study is to better understand labor dynamics in the agricultural sector in Papua New Guinea (PNG).

Specifically, the report assesses the impact of gender-differentiated domestic work burdens on the ability of women to allocate their labor to the time-critical tasks of cultivation, harvesting and processing of agricultural products – in particular for coffee and cocoa. The report identifies gender-disaggregated trends in time allocation and links these patterns to household welfare outcomes. It tests how different variables (education, age, women's empowerment, etc.) influence allocation of labor to agriculture (vs. other tasks) within households and if this influences household income generation and welfare.

This report is the first known study of its kind. The only other study to provide estimates of men's and women's time-use in the coffee sector dates from the late 1990s and relies on data collected in 1992–93 (Overfield 1998). The recent World Bank Group *Fruit of Her Labor* report that focused on the coffee, cocoa, and fresh produce sectors in PNG concluded that data on the allocation of men's and women's labor to the range of tasks along the supply chain, notably with respect to production and post-harvest processing, are virtually non-existent.

In the absence of detailed sex-disaggregated data on labor use, it is not possible to attribute to men or to women their respective contributions to value-addition in these supply chains, nor to determine the specific distribution of income or other benefits from chain activities between men and women.

The Productive Partnership in Agriculture Project (PPAP) intermediate impact evaluation survey provided an opportunity to conduct further research on labor allocation in the coffee and cocoa sectors to understand intra-household decision making and its effects on women's ability to participate in the agricultural sector. PPAP is a $100 million project, financed by The World Bank, International Fund for Agricultural Development, European Union, Government of PNG and private stakeholders, supporting smallholder cocoa and coffee development across the country. The PPAP evaluation survey has a sample size of around 1,480 households in three areas – East New Britain Province (500 households), the Autonomous Region of Bougainville (300 households), and the Highlands region composed of Western Highlands, Jiwaka and Simbu Provinces (680 households). While the PPAP baseline survey did provide information on the share of women receiving income from coffee, it did not address the underlying dynamics of intra-household decision making.

The survey of PPAP cocoa farmers was conducted between April and August 2017 and between April and December 2017 for coffee farmers. The survey includes a rich set of modules on socio-demographic characteristics, occupation and work conditions, household agriculture production, project participation, housing characteristics, water collection and sanitation, assets and equipment owned, participation in associations and groups, and income and life-satisfaction. Furthermore, two modules were added: a time-use module and a women's empowerment module.

II. MAIN FINDINGS

A. UNDERSTANDING LABOR DYNAMICS IN THE AGRICULTURAL SECTOR IN PNG

1. Men and Women Do Not Share the Same Activities or Tasks Within the Household

Men's work is geared more towards cocoa or coffee production whereas women are more focused on other agricultural activities (Figure 1-A).

Women are more likely to run their own business alongside other farming activities (i.e. alternative crops), than working with cocoa or coffee. Women are generally involved in the lower-value stages of the cocoa value chain (e.g. harvesting and sale of wet beans), whereas men capture more of the value at later stages (e.g. drying and sale of dry beans).

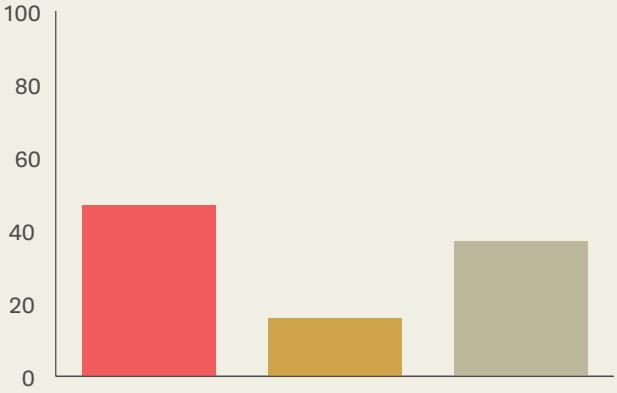
Although women understand that their activities in cocoa production are key to the quality of the end product, they are in fact more likely to engage in other agricultural production activities which give them a more direct gain.

Men work longer hours in profitable activities, especially in cocoa and coffee activities, whereas women are particularly busy with domestic activities. The average number of hours spent in cocoa production by men is almost triple that of women in the cocoa-growing areas and double in the coffee-growing areas. Adding up all hours worked (including domestic work), women work on average 2.7 hours more per day than men in the cocoa-growing areas and 1.7 hours more per day in the coffee-growing areas (Figure 2-A).

FIGURE 1-A

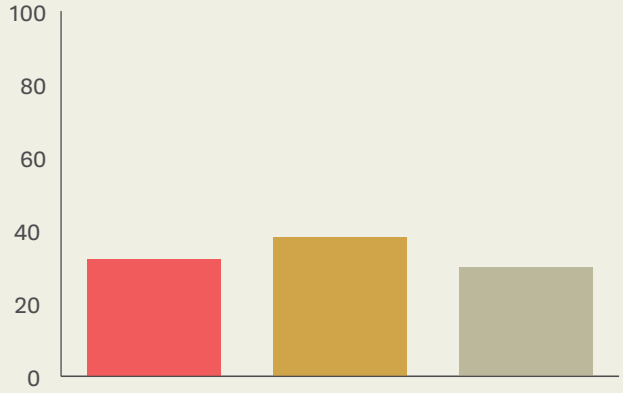
Understanding Labor Dynamics in the Agricultural Sector in PNG

In the cocoa sector:



Men

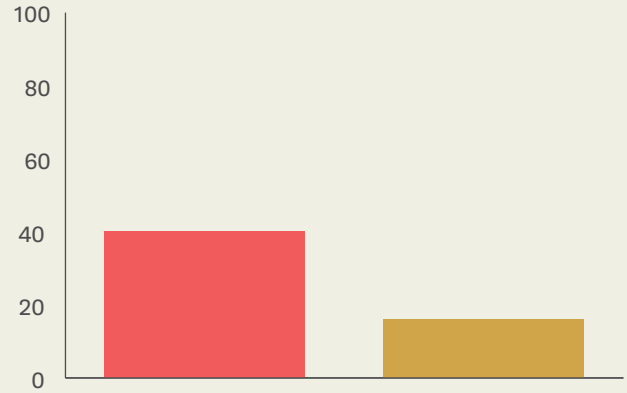
Self-employed	47%
Self-employed in other agricultural activities	16%
Other	37%



Women

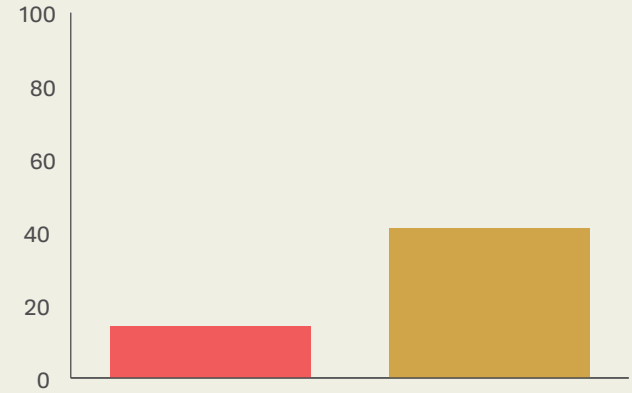
Self-employed	32%
Self-employed in other agricultural activities	38%
Other	30%

In the coffee sector:



Men

Self-employed	40%
Self-employed in other agricultural activities	16%



Women

Self-employed	14%
Self-employed in other agricultural activities	41%

FIGURE 2-A

MEN WORK LONGER HOURS IN PROFITABLE ACTIVITIES

Cocoa Field Work

1.4 hours for Men
0.5 hours for Women

Cocoa Processing

0.2 hours for Men
0.1 hours for Women

Coffee Field Work

1.3 hours for Men
0.6 hours for Women

Coffee Processing

0.2 hours for Men
0.2 hours for Women

WOMEN ARE FREQUENTLY BUSY WITH DOMESTIC ACTIVITIES

Daily Household Work in Cocoa-Growing areas

1.4 hours for Men
5.5 hours for Women

Daily Household Work in Coffee-Growing areas

0.8 hours for Men
3.1 hours for Women

Education is an important factor to explain gender differences in time-use, specifically in cocoa-growing areas. In these areas, years of schooling has a positive and significant effect on total hours of work and formal working time of women, and a negative effect on time allocated by women to domestic work. Among other determinants are:

- The number of children, which has a positive and significant effect on hours dedicated to domestic work, both for women and men;
- Literacy in Pidgin and having access to the internet, which has a negative and significant effect on total hours of work for women; and
- Age influences negatively total hours of work for men and domestic time for women.

Unlike cocoa-growing areas, women's empowerment and decision-making variables have statistically significant effects on time-use in coffee-growing areas.

2. Discrimination against Women's Work

Intra-household decision making ignores the needs and capabilities of women which leads to discrimination and inefficiencies. While certain characteristics, such as education and age, explain gender differences in hours worked, they don't tell the whole picture. Even in the presence of more educated women, the average time-use gaps between women and men remain about the same. This highlights that characteristics between the genders only accounts for a small part of the time-use gap.

3. Non-Cooperative Behavior within the Household

Intra-household decision making processes influence the allocation of time and household efficiency. When it comes to purchasing decisions, partners often make decisions together. However, we found that women are more likely than men to make decisions alone.

Analysing purchasing decision behaviors shows that in cocoa-growing areas owning a phone or having access to the internet significantly correlates with higher bargaining power of women. In contrast, women's bargaining power is lower when household asset wealth increases in couples, and within larger households. The patriarchy still has a strong influence in a matrilineal society because household decisions are family based and may not always recognise the power of women in matrilineage.

Men and women perceive household decision making differently. These differences are symptomatic of limited rationality in decision making and non-cooperative behaviors. Whatever the destination, it appears that having to ask permission from the other partner to go to various places remains relatively frequent in cocoa-growing areas while it is less so in coffee-growing areas. However, women have to ask for permission more in both cocoa and coffee-growing areas (Figure 3-A).

FIGURE 3-A

Men and Women Perceive Household Decision Making Differently

Cocoa-Growing Areas

52% - 65%

of men have to ask for permission

63% - 79%

of women have to ask for permission

Coffee-Growing Areas

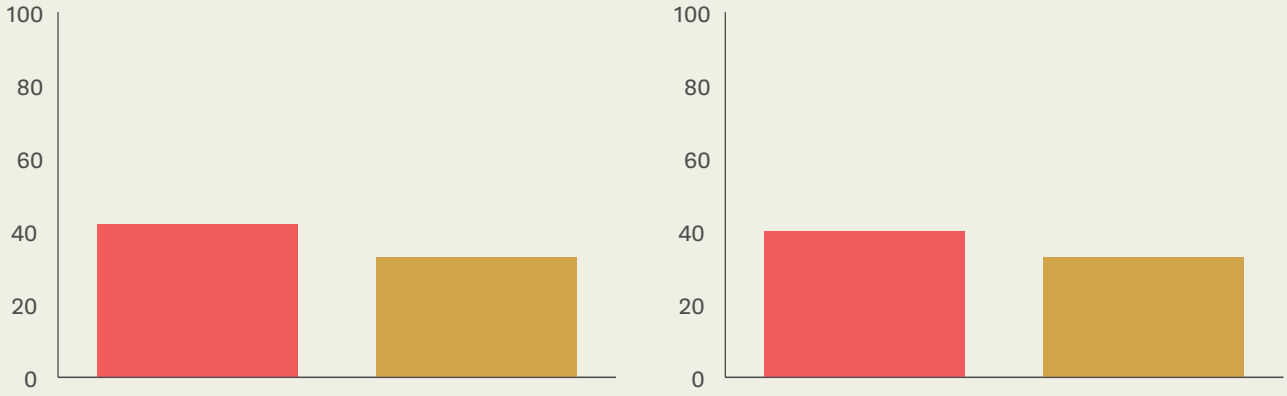
26% - 37%

of men have to ask for permission

43% - 56%

of women have to ask for permission

In cocoa-growing areas, partners frequently agree on most topics, and reported the main family problems in the last two years as being the following:



Men

Lack of Money	42%
Illness of a Household Member	33%

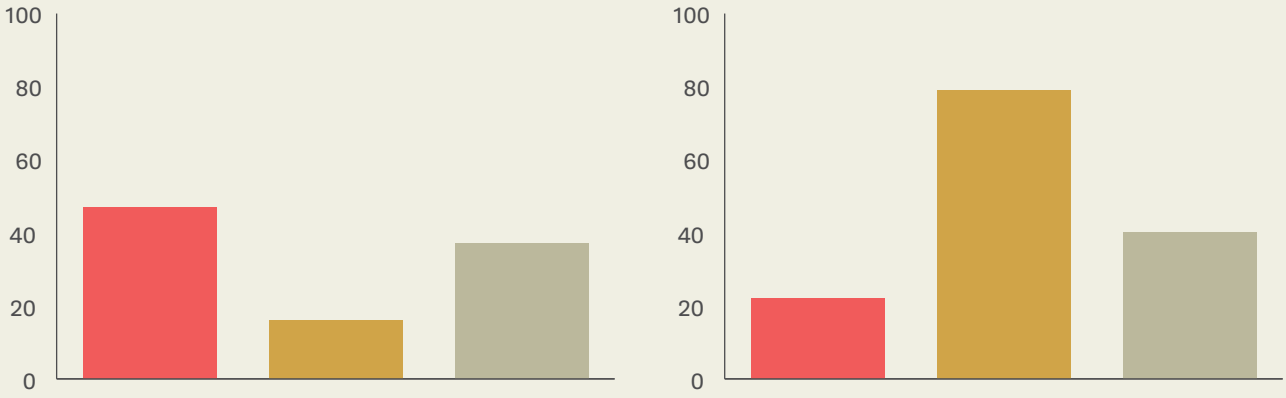
Women

Lack of Money	40%
Illness of a Household Member	33%

Alcoholism and addiction of a household member and domestic violence concern women more than men. In coffee-growing areas, family problems are more common than in cocoa-growing areas in particular (Figure 4-A):

FIGURE 4-A

Family Problems are More Common in Coffee-Growing Areas



Men

Bad Relationships between Parents and Children	22%
Lack of money	79%
Domestic Violence	40%

Women

Bad Relationships between Parents and Children	28%
Lack of money	76%
Domestic Violence	40%

B. IMPACT ON PRODUCTION EFFICIENCY

Household efficiency and allocation of labor within the household remain closely linked; they both depend on various determinants: economic factors, bargaining power and skills of household members, as well as non-economic factors. The impact these factors have on agricultural income is important as it determines the efficiency of production.

In-depth analysis of household production and welfare requires an econometric approach that makes the most of the available data. Given the richness of the data, omitted variable bias can be typically avoided when adding new regressors to the model. Endogeneity bias is also taken into account by using the dynamic nature of the data, for instance by introducing lagged explanatory variables in regression models. However, it is not possible to fully use the 2012–2017 panel because the time-use variables are only observable once in 2017. The instrumental variable method is also difficult to implement because of the lack of valid instruments. Instead, our approach lies in the reasoned use of available data to measure the impact of time allocation and other variables on household production and welfare.

The results show that higher bargaining power of women and the availability of labor have significant positive impacts on cocoa production yield measured by cocoa income per tree. Participation in agricultural groups and participation in PPAP have significant positive impacts on the number of trees in cocoa production. The quality of pruning is also positively affected by involvement in PPAP and/or agricultural group participation, as well as by other variables such as hours of formal work, household asset wealth, number of 13-17-year-old household members, and the family problem variable.

In coffee-growing areas, income per tree is positively affected by the number of 18-59-year-old members and the women decision index and negatively affected by women's empowerment indices such as the agreement index and the family problem index. Regression models include women's empowerment indices as explanatory variables. These indices are linear combinations of categorical variables obtained from multiple correspondence analysis. Using these indices, the findings indicate that women's empowerment generally improves household production and efficiency.

C. IMPACT ON HOUSEHOLD INCOME AND WELFARE

Cocoa production and income represent only one-fifth of total household income in 2016, whereas coffee represents two thirds. Male-headed households earn a higher income compared to female-headed households. Food sufficiency is also higher among male-headed households than among female-headed households (97 percent against 75 percent in cocoa-growing areas).

In cocoa-growing areas, household income per capita is positively affected by hours of formal work, asset wealth, living in Bougainville, the male decision index, female selling cocoa, and female managing household accounts. But it is negatively affected by the percentage of income accruing to alternative crops production. Women who are more in control of the sale of cocoa and the management of money that comes from sales can increase their income and household welfare. The man can still have important decision making power within the household, in so far as it allows an improved yield of agricultural production (farm income, and more specifically, cocoa income per tree). Other variables that have a significant negative effect on per capita total household income include:

- Female head;
- Household size;
- Permission index;
- Male involved in planning;
- Female involved in receiving payments (all things equal this variable is also negatively correlated with agricultural production and income); and
- Partners being "afraid to disagree."

In coffee-growing areas, household income per capita is affected by the same determinants as in cocoa-growing areas, except for women's empowerment and decision-making variables which are not as significant. However, a woman's ability to make decisions still has a positive and statistically significant effect on income per capita, while men making decisions has a negative impact on household well-being as measured by income per capita.

The report further investigated the effect of different variables on household welfare using the welfare scale which indicates the position of the household from 1 the poorest to 10 the richest, today, five years ago, and in five years (Figure 1-C).

FIGURE 1-C

The Welfare Scale in Cocoa-Growing Areas is Positively Affected by Various Variables

In cocoa-growing areas, it appears that the welfare scale today is positively affected by:

Female hours of domestic work | Asset wealth | Living in Bougainville | The number of members 60+ | The male decision index | Male involved in planning and decision making about cocoa production

Welfare scale five years ago is positively and significantly correlated with:

Asset wealth index | Number of members 60+ | Permission index | Agreement index | Family problem index | Women decision index | Females primarily involved in selling cocoa

Welfare scale in five years in the future is negatively correlated with:

Female hours of domestic work

Welfare scale in five years in the future is positively correlated with:

Asset wealth | Living in Bougainville | Participation in PPAP | Family problem index | Females primarily involved in selling cocoa

In coffee-growing areas, "bargaining power" or women empowerment variables have a positive effect on the overall optimism of the household (measured as self-perceived wealth in five years). The share of alternative crop income in total income is significantly and positively correlated with self-perceived wealth today and five years ago, but has a negative effect on self-perceived wealth in five years. Among women's empowerment and decision-making variables, the permission index is positively correlated with wealth scale today and five years ago, whereas the agreement index is negatively correlated with the wealth scale today, five years ago, and in five years. The family problem index is negatively correlated with the wealth scale five years ago. Both women decision index and female involved in planning and decision making about coffee production have positive effects on self-perceived wealth today, five years ago, and in five years.

III. MAIN RECOMMENDATIONS

From the results, it is possible to draw recommendations to improve household production and welfare. First, household awareness and training on gender dynamics and increased responsibilities of women could improve welfare outcomes for all household members. Indeed, it appears that empowering women can improve household welfare outcomes. For instance, the results show that household welfare outcomes are higher when women have more control over cocoa sales and the resulting income, and empowered women are also more likely to have an equal relationship with their male partner with whom they are not afraid to disagree over household decision-making.

Second, women in PNG carry a substantial burden of domestic work which leaves them little time to substantively engage in more value-added agricultural activities. Without a parallel effort to reduce the domestic burden, projects that seek to directly engage women in higher value agricultural activities may thus only result in a greater overall workload for women. The domestic workload may be reduced by technological interventions to reduce labour inputs, or by a more equal sharing of domestic tasks between household members through awareness-raising.

Photo: Thomas Perry/World Bank

Photo: Thomas Perry/World Bank.

1. INTRODUCTION

1.1. BACKGROUND AND CONTEXT

Papua New Guinea is an agriculture-based economy: the majority of the population lives in rural areas, and the agricultural sector accounts for approximately one-third of Gross Domestic Product. The sector is dominated by smallholder farming systems, with almost all farmers growing subsistence food crops and an increasing number producing surpluses for sale in local markets. Smallholder farmers also engage in cash crop production, most notably coffee and cocoa, with around 50 percent of the labor force engaged in the production, processing, and sale of these two commodities.

The Pacific region and PNG in particular, registers some of the worst gender indicators in the world in relation to political representation, gender-based violence and access to economic opportunities. Given the importance of the agricultural sector for employment and income generation, a specific study on women in agriculture in PNG was commissioned by The World Bank Group in 2014. *The Fruit of Her Labor: Promoting Gender-Equitable Agribusiness in Papua New Guinea* report focused on women's engagement in the coffee, cocoa, and horticulture value chains (World Bank Group 2014). It found that labor allocation issues fundamentally affect the performance of the coffee, cocoa, and fresh produce agribusiness supply chains in PNG. Of particular importance are gender differences in labor allocation and in rewards to labor, and the ways in which social, cultural and economic factors intersect in determining labor use.

This report made a series of recommendations focused on improving outcomes for women in the agricultural sector, which were being used to inform ongoing World Bank and International Finance Corporation operations in the coffee, cocoa and horticulture sectors. The report also identified the need to undertake a time-use survey of the agricultural sector in PNG.

1.1.1. WOMEN IN AGRICULTURE

The World Bank undertook a Country Gender Assessment in 2012, which identified key gender issues in PNG (World Bank 2012). It specifically addressed issues related to the challenge of providing gender-inclusive access to employment and economic resources. The main findings relating to economic opportunity remained too general to fully understand the challenges facing the agricultural sector, particularly cocoa, coffee, and horticultural agribusinesses.

As mentioned, in 2014, The World Bank undertook a more specific study on women in agriculture activities in PNG in order to achieve greater impact for women from its current activities in agribusiness, and to provide clear recommendations on additional interventions aimed at improving outcomes for women. The report focused on the supply chains for coffee, cocoa, and horticultural products (fresh produce) and paid particular attention to the roles and constraints faced by smallholders (Box 1-A).

BOX 1-A

Main Findings of The Fruit of Her Labor Report Relating to Household Allocation and Efficiency of Time in PNG

+ Women provide substantial labor in both coffee and cocoa cultivation. Analysis of the supply chains indicates that the specific tasks women undertake have a substantial bearing on the quality of the final product: women are critical to improving the quality of coffee, cocoa, and fresh produce in PNG. Women see their main roles are in the weeding, picking, milling, and drying, land clearing, and selling but not as much as men (Murray and Prior 2014). These perceptions also bear out in the disproportionate burden of domestic work that falls on women.

+ The ability of women in PNG to contribute to improving the quality of coffee, cocoa, and fresh produce is affected by low economic incentives for women either to allocate sufficient labor to these tasks or to do them well. There is a substantial gap between the work done by women in the coffee and cocoa sectors and the benefit they obtain since women do much (if not most) of the work, but have much less access to, or control of, the resulting income.

+ Women's access to the knowledge and skills required to carry out these tasks is extremely limited, as gaps in education, literacy, skills, and participation in extension and training activities persist.

+ There are also important gender-specific dynamics at work in PNG society that affect men's and women's capacity to exercise economic agency differentially. PNG society is largely patriarchal, and even in matrilineal regions, men are seen as household heads and primary decision-makers. As a result, women have less access to, and control of, the resources needed to function economically, notably land and capital (financial services).

+ Farmers experience labor shortages. Households do not have enough labor to do all the things they need to do the things at the right time and in the right way. However, the division of labor is unequal: women work more than men, especially when domestic work is included (Overfield 1998). Cocoa Pod Borer exacerbates the labor constraint by requiring an even more labor-intensive approach to cocoa block management and cultivation.

+ Women are mostly confined to, and can only benefit from, short supply chains. Lack of mobility means that women are largely excluded from key downstream activities along the supply chains, where cocoa and coffee is sold to exporters (done by men, who, according to many women interviewed, then pocket the cash).

+ Several key services are either absent or insufficient. This includes the limited reach, and focus of extension services, weak and inconsistent input supply, lack of new varieties that are not readily available to farmers, and limited access to financial services. There are also important gender-specific barriers to accessing finance, as women tend not to own the land, fixed assets, or other resources that are needed to meet collateral requirements.

Another recent report by Australian Centre for International Agricultural Research (2017) titled *Improving Livelihoods of Smallholder Families through Increased Productivity of Coffee-based Farming Systems in the Highlands of PNG* provides interesting findings on income diversification and gender issues in coffee production areas (Box 1-B).

BOX 1-B

Main Findings of the ACIAR Report

+ There are strong economic incentives for women to commit labor to vegetable and fruit production because they are confident that their labor efforts in food production for markets will be rewarded through controlling the income they earn.
+ Uncertainty overpayment of women's labor in coffee is one of the key drivers of women's emphasis on vegetable and fruit production in areas with high market accessibility.
+ When remuneration of women's labor is uncertain, they often withdraw all or part of the labor from export crop production and redirect it to activities where they have greater control over the income generated from their labor.
+ Households that work cooperatively and harmoniously as a family, tend to have higher production (Curry and Koczberski 2004; Curry et al. 2007). Harmonious relationships among family members help ensure their ongoing commitment to and participation in export crop production.
+ Women and young males complained about what they perceived as the unfair distribution of coffee income by the male head of the household. They felt that they, or their family as a whole, were not benefiting from the income earned from coffee production.

Source: World Bank Group, (2014)

1.1.2. WOMEN'S EMPOWERMENT

Women's empowerment and intra-household allocation of time may have an important impact on the performance of small agricultural units, especially in coffee, cocoa, and fresh produce agribusiness supply chains in PNG.

Women's time allocation to different tasks can be determined by both economic constraints (Becker 1965; Gronau 1977) and cultural determinants or social status (Khandker 1988; Eswaran et al. 2013). These issues are keys to understanding the performance of agribusiness supply chains. This is the case for five principal reasons:

- Smallholders do not view their activity as a business, as they might value differently various activities during their daytime;
- A lot of labor is allocated for social purposes, due to socio-cultural biases to allocate time;
- Farmers experience labor shortages, and this can be explained by gender differences in time-use;
- Farming systems are highly diversified, as it is for time-use within households; and
- Women can only benefit from short supply chains, in part due to time (and socio-cultural) constraints.

1.1.3. ALLOCATION OF TIME WITHIN THE HOUSEHOLD

Time-use studies measure two things: the quantity of time spent on particular activities, and the quality of time spent on activities and the people concerned by these activities. For the purpose of this study, some important measurement issues can be pointed out:

- Do men's and women's participation in particular agricultural activities result in less time available for adequate care and feeding of young children, or other activities which can determine household well-being? More generally, to what extent does women's time-use contribute to household production and well-being?
- What explains the differences observed between women and men in terms of time-use? Does this rely on different economic opportunities for women and men, or, otherwise, various legal, social or cultural determinants?

All members of the household must participate in the time-use survey. To be able to make useful comparisons, we need to know about the quantity and quality of time spent by all the women and men and boys and girls within the household including domestic work so that a complete picture of labor use of men and women can be obtained. Identifying whether individuals are "time poor" also requires an understanding of work intensity that combines information on a full account of time spent in a given period as well as the drudgery and physical or mental effort associated with various tasks.

1.2. STUDY RATIONALE

The objective of this time-use study was to better understand labor dynamics in the agricultural sector in PNG. Specifically, what is the impact of gender-differentiated domestic work burdens on the ability of women to allocate their labor to the time-critical tasks of cultivation, harvesting and processing of agricultural products – in particular coffee and cocoa? Our analysis will help to improve understanding of:

- The balance between economic and social/other activities for both men and women;
- Gender differences in labor use and availability in the coffee and cocoa sectors;
- Gender differences in the nature and extent of labor constraint/shortages (whether seasonal or task-specific) in these sectors; and
- The implications of these different uses of time by men and women, and differences in the availability of time by men and women for sector strategies and expansion of economic activity in these sectors.

The report aims to identify gender-disaggregated trends in time allocation and links these patterns to household welfare outcomes. The report shows how different variables (education, age, women's empowerment, involvement in PPAP, etc.) influence allocation of labor to agriculture (vs. other tasks) within households and whether this influences household income generation.

1.3. METHODOLOGICAL APPROACH

The PPAP Intermediate Impact Evaluation Survey provided a unique and valuable opportunity to address the information gap identified in *The Fruit of Her Labour* report through the inclusion of a gender/time-use module. Our time-use module has generated additional data on the allocation of time by men and women in the coffee and cocoa sectors, including on:

- Agricultural and non-agricultural economic activities;
- Domestic work related to household tasks (cooking, elder and child care, fuel/water provisioning, household building/maintenance work);
- Social and cultural activities, including church and community commitments, time spent accessing and using social and other services (education, health); and
- Leisure/social activities.

Photo: Thomas Perry/World Bank

2. METHODOLOGY AND DATA

2.1. DATA

2.1.1. TIME-USE: FRAMEWORK

Time-use surveys are designed to account for the nature, duration, and location of all activities carried out by the population during a reference period. The focus of these surveys is to understand human behavior and the lifestyle of people, especially for the portion of their life for which no information is available from traditional data sources (Aguiar et al. 2012; Charmes 2015; Hurst 2015; Seymour et al. 2017; UN 2004). A time-use survey gives a complete picture of the society by providing detailed information about how people spend their days (all 24 hours) on different economic and non-economic activities. Time-use surveys measure total time resources in terms of:

- Market activities;
- Productive domestic activities; and
- Leisure activities (producing satisfaction rather than goods).

This time-use study seeks to link time-use patterns to household welfare outcomes. This is done with reference to the results of the other modules of the PPAP Intermediate Impact Evaluation Survey.

The broader evaluation survey includes a rich set of modules on socio-demographic characteristics, occupation and work conditions, household agriculture production, project participation, housing characteristics, water collection and sanitation, assets and equipment owned, participation to associations and groups, and income and life-satisfaction.

2.1.2. TIME-USE: DATA COLLECTION

The respondents' daily activities were recorded through face-to-face interviews, rather than asking them to fill in a diary. This methodology has been used because of the high level of illiteracy in PNG. The report considered a 24-hours diary with fixed 1-hour time slots. In each slot, respondents were asked to report if they performed more than one activity. A secondary activity could thus be reported.

Time-use data was collected from all individuals in the household aged 15 and over using the 24-hour recall method. This method is considered more accurate as compared to others (for example a weekly recall period) because it is more detailed and easier for respondents to recall what they did the day before (Juster and Stafford 1991). It allowed the time-use data to be collected on one occasion in line with the design of the overall PPAP Intermediate Impact Evaluation survey, which only included one visit per household (Figure2-A).

FIGURE 2-A:

Typical Examples Of Activities On Which A Person May Spend Time During The Course Of A Day

Sleeping

Eating

Unpaid domestic services (for example, food preparation, cleaning the dwelling, and shopping).

Working in primary production (growing of crops, animal husbandry, and fishing) and doing unpaid 'economic' work (such as fetching water or collecting firewood, or working unpaid in the family business)

Unpaid care services (care for children and adult, teaching children, etc.)

2.1.3. WOMEN'S EMPOWERMENT MODULE

A random sample of women was selected to answer questions in a women's empowerment specific module.[1] Partners of these selected women were also interviewed in a separate module to allow consideration of gender issues and intra-household bargaining. The women's empowerment module includes a number of questions concerning the relationship between the partners:

- Whether she/he needs permission from her/his partner to do special activities or purchases;
- Whether partners agree on various topics;
- Whether they are afraid to disagree;
- Existence of family problems; and
- Who takes important decisions in the family.

Women's empowerment might have beneficial effects on the household well-being. In particular, female empowerment is particularly beneficial for children's health, nutrition, and education and can favor poverty reduction and yield a higher level of development.

2.2. EMPIRICAL STRATEGY

The report assessed the determinants of the allocation of time within the household in a regression framework using a wide range of household-level and individual-level variables available in the survey. These variables can be split into four broad categories:

- Socio-demographic and endowments variables (age, years of schooling, literacy, household size and composition, education, training, and information), as well as geographic location variables;
- Opportunity cost variables such as hours wage of an outsider;
- Participation to associations and groups, and participation to PPAP; and
- Bargaining power and decision-making variables such as: agreement index, family index, decision index (refer to Box 2-A and presentation in Appendix B), male/female involved in planning and decision making about cocoa/coffee production, female primarily involved in selling coffee, female primarily involved in receiving payments for cocoa/coffee, female manage account, afraid to disagree, and found at risk.

The variables belonging to the first category are the most likely to be exogenous. Although households may choose their level of education, geographic location or the number of children, these variables remain relatively invariant and they are loosely instrumental for policy purpose.

The second set of categories are included in the analysis as control variables. Opportunity costs as measured by the salaries of outsiders can also be used as control variables since they are distant proxies and probably measured with error.

Participation in groups and PPAP, in the third category, are possibly endogenous due to self-selection. However, participation to PPAP should not be considered as strictly endogenous when it concerns the village and not just one given household. Indeed, using village participation to PPAP and regression controls is a better approach in our context.

Bargaining power variables in category four are the key variables of our analysis. However, their endogeneity is very likely and can't be used to infer their causal impact with confidence. Despite this, the correlation between time allocation and bargaining power or decision-making variables remains essential to fully understand intra-household behaviors.

Box 2-A provides information on the composite indicators.

1. A woman was selected in each household at random in order to answer a specific module concerning women's empowerment. In this perspective, she must meet certain criteria: be 15 years of age or over, and have a partner (or have had in the past a partner)–whatever her age.

BOX 2-A

Composite Indicators

+ Asset wealth index, permission index, agreement index, family problem index and decision index are measured and presented in Appendices B-1 (cocoa-growing areas) and B-2 (coffee-growing areas). Each index is a composite indicator that is a linear combination of categorical variables obtained from a multiple correspondence analysis (see Asselin 2009):

$$Index_i = \sum_{k=1}^{K} F_{1k} d_{ki}$$

+ Where $Index_i$ is the value of the composite index for the ith observation (household or individual), d_{ki} is the value of the kth dummy variable (with k=1...K) describing the variables considered in the analysis (for instance, asset variables, housing characteristics and equipment variables in the case of the asset wealth index), and F_{1k} is the first component of the analysis. Built this way the composite index can be described as the best regressed latent variable on the K primary indicators, since no other explained variable is more informative.

+ Appendices B-1 and B-2 present index weight, mean and partial inertia of explanatory variables. As shown in Tables B1-1 and B2-1 for the asset- wealth index, variables considered in the analysis are asset variables, housing characteristics, agricultural materials owned by the household, sells of animals and bank account ownership. Almost all variables have positive weights and partial inertia is indicated for each of them as being less than 0.1 (higher partial inertia for television and one block variable). Tables B1-2 and B2-2 present the permission index for both women and men which measures the extent to which an individual has to ask permission to her/his partner to go somewhere. Agreement index weights are presented in Tables B1-3 and B2-3.

  This index gets higher when partners agree on more topics. Family problem index is also a linear combination of main problems in family with mostly positive weights of explanatory variables (Tables B1-4 and B2-4).

  Interestingly enough, domestic violence appears the most correlated variable. Finally, decision indices for both women (women decide) and men (men decide) are presented in Tables B1-5 and B2-5.


Photo: PPAP, PNG

3. RESULTS

3.1. GENDER DIFFERENCES IN EDUCATION, EMPLOYMENT AND INCOME

The PPAP survey shows us the educational characteristics of the members of the households surveyed. For individuals who attend the education system, the level in which they are enrolled can be observed. For individuals who are not enrolled in the education system, the report explores the reasons for non-participation and the level attained before stopping.

COCOA-GROWING AREAS

Concerning cocoa-growing areas, the main findings are as follows (Box 3-A; also see Appendix C for complementary Tables C-1 to C-6).

BOX 3-A

Gender Differences in Education, Employment and Income: Findings in Cocoa-Growing Areas

+ There is no gender gap in school attendance (around 70 percent for both women and men) which is relatively high among younger aged individuals (81 percent among 6-13-year-olds and 88 percent among 14-18-year-olds).
+ There is not a gender gap in literacy and younger women (10-24 year-olds) are likely to be literate. Conversely, literacy is higher among men aged 40-years-old and over than among women of the same age.
+ More men than women are attending university (12.2 percent vs. 3.9 percent).
+ Years of schooling completed are significantly higher among men than among women (7.9 vs. 7.4).
+ The labor force participation rate is higher among men (79 percent) than among women (75 percent) when considering 10-69-year-old people; however, the gender gap is not significant among 25-69-year-olds (both women and men participation rates are around 95 percent).
+ Women work more often in part-time roles than men (67.5 percent vs. 62.1 percent).
+ No clear gap between men and women in terms of occupations can be reported.
+ More men are self-employed in the cocoa sector than women (47.3 percent vs. 32.0 percent). However, it is important to note that this statistic is not representative of the whole country as part of the sample of households has been selected because they were participating to the PPAP.
+ Women are more self-employed in other agriculture activities compared to men (37.8 percent vs. 15.9 percent).
+ More men are employed in the public and private sectors than women (18.3 percent vs. 12.8 percent).
+ Unpaid family workers represent only 8.6 percent of women and 6.4 percent of men. Of those who do not work, only 5.6 percent of women and 2.5 percent of men declare they have to care for children.

Overall, if we compare households headed by a woman with those headed by a man, one can make the following observations on household income (Box 3-B).

BOX 3-B

Income Differences between Female and Male-Headed Households in Cocoa-Growing Areas

+ The greatest gender income difference is that men are more likely to hold a salaried job (4.3 percent of women-head households vs. 11.4 percent of men-head households). Woman and man-headed households earn roughly the same earnings from cocoa (which is main source of income for 39.1 percent of female-headed households vs. 47.9 percent of male-headed households) and other agriculture products (45.7 percent vs. 33 percent).
+ Gender gaps are higher when considering income by source. Incomes earned by households whose head is a man are much higher than those earned by households headed by a woman: in particular, incomes from cocoa dry bean, coconuts, off-farm, nonfarm, hunting, and fishing. These gender differences have widened since 2011, especially for off-farm income and total income.
+ Food sufficiency is higher among male-headed households than among female-headed households (96.5 percent vs. 75.0 percent). Once again, gender difference is much greater in 2016 than in 2011; in 2011, self-sufficiency was very high (90 percent of households were self-sufficient).
+ Family structure does not differ much between male-headed households and female-headed households, except that single parenthood among female-headed households logically decreases average size of household: on average, there are 4.1 members in male-headed households and 3.2 members in female-headed households.
+ The gender difference in wealth is significant between male-headed households and female-headed households when they self-assess their wealth in five years: women appear to be less optimistic than men (average wealth in five years is evaluated at 5.8 among female-headed households, whereas it is 6.6 among male-headed households).

COFFEE-GROWING AREAS

In coffee-growing areas (Box 3-C), similar patterns as in cocoa-growing areas are found with some noticeable differences (see Appendix D for complementary Tables D-1 to D-6).

BOX 3-C

Gender Differences in Coffee-Growing Areas

+ Men are generally more educated and attend school more often than women, especially among 19-24-year-olds. Years completed is 5.0 for men and 3.5 for women. The literacy rate is also higher among men than among women.
+ The employment rate is higher among women (95 percent) than among men (92 percent).
+ Women are more often declared as a farmer (78 percent) than men (68 percent), while men are more often declared as clerical workers or as professional workers.
+ More men are self-employed in the coffee sector than women by a significant amount (40 percent vs. 14 percent). While 19 percent of women (vs. 11 percent for men) are employed as unpaid family workers.
+ Unlike cocoa-growing areas, a large proportion of income comes from coffee activity (64 percent as compared to only 19 percent for cocoa in 2016). It is also interesting to note that, in 2016, coffee represents the main source of income for 96 percent of female-headed households compared to 83 percent of male-headed households.
+ Income per capita is higher in female-headed households than in male-headed households although this is not statistically significant in 2016. Furthermore, unlike cocoa-growing areas, we find no gender difference in self-assessed wealth between male-headed households and female-headed households.

3.2. WOMEN'S EMPOWERMENT AND INTRA-HOUSEHOLD DECISION MAKING

COCOA-GROWING AREAS

Main findings for cocoa are highlighted in Box 3-D. See Appendix C for Complementary Table

BOX 3-D

Women's Empowerment and Intra-Household Decision Making in Cocoa-Growing Areas

+ Household asset wealth has a negative and statistically significant effect on the occurrence that a woman makes purchasing decisions alone, the same as marriage and household size; a possible interpretation of this result is that bargaining power of women in the household seems to decrease according to these variables.
+ It is significantly more common for older women to make buying decisions alone; bargaining power being reinforced, and, interestingly, it is the same when holding her own phone or having internet access. The impact of technology on the bargaining power of women appears to be significant.
+ The effect of these variables is reversed when the decision is made by both man and woman; indeed, less bargaining power should force a woman to get along with her partner for purchasing decisions.
+ Living in ARB (where matrilineality is widespread) does not have a statistically significant effect on the bargaining power of women. As such, patriarchy does not seem to have a lesser influence in matrilineal society because household decisions are family based and may not always recognise the power of women in matrilineage.

COFFEE-GROWING AREAS

Fewer variables have a significant effect on decision making in coffee-growing areas. Age has a positive effect on the occurrence that woman makes purchasing decisions alone, whereas the impact of PPAP is negative (i.e. more decisions are made jointly between husbands and wives in PPAP areas). Living in Simbu has a negative and statistically significant effect on joint decisions.

Tables 1-A and 1-B below describes the role of a partner from the perspective of both selected woman and her partner.

COCOA-GROWING AREAS

In cocoa-growing areas, 91.3 percent of the selected women currently have a partner, 8.7 percent declared they had one in the past.

Having to ask permission to go in various places remains relatively frequent in cocoa-growing areas, with rates of around 63 percent to 79 percent among selected woman, whereas 52 percent to 65 percent of men ask permission to their woman partner. Whatever the destination, statistically significant differences exist between women and men.

Partners seem to frequently agree on most topics, with rates ranging from around 70 percent to over 90 percent for both female and male. Significant differences are observed between female (selected woman) and male (partner of selected woman) for agreement on family (90.7 percent for woman and 94.5 percent for male), money (88.7 percent for woman and 93.5 percent for male), work (86.2 percent for woman and 92.6 percent for male), relationship between parents and children (87.8 percent for woman and 92.8 percent for male), and agreement on education of children (90.9 percent for woman and 95.5 percent for male). Over 80 percent of women and men consult their partner for buying clothes (no significant difference between women and men) and over 85 percent for children's purchases (significant gender difference: 85.8 percent among women and 90.0 percent among men).

In cocoa-growing areas, about one-third of women are afraid to disagree with their partner because they will be angry with them, while only one-fifth of men are (a statistically significant difference).

A significant difference exists between women and men concerning being afraid of disagreement with partner and angriness with children (18.3 percent of women and 9.1 percent of men). 26.7 percent of women were found at risk due to their partner's temperament, whereas only 9.3 percent of men declare they were (statistically significant difference between both).

Finally, ownership of a phone is significantly higher for men (60.5 percent declare they have their own phone) than for women (38.8 percent). Only 5.1 percent of women and 6.7 percent of men have access to the internet, without a statistically significant difference.

COFFEE-GROWING AREAS

In coffee-growing areas, 88.5 percent of the selected women currently have a partner, 11.5 percent declared they had one in the past. Compared to cocoa-growing areas, both women and men are less likely to ask permission to go somewhere. About half of the women ask for permission, compared to less than one-third among men. Furthermore, four out of five people, women and men, generally agree with their partner. This is a lower proportion than in cocoa-growing areas. Nevertheless, in coffee-growing areas, the gender gap appears to be not statistically significant.

Compared to cocoa-growing areas, both men and women are less likely to consult their partners: to buy clothes (67 percent among women vs. 47 percent among men), or for children purchases (76 percent among women vs. 59 percent among men). Nevertheless, they are much more likely of being afraid to disagree: 57 percent of women and 31 percent of men are afraid to disagree with their partner because they will be angry with them; 35 percent of women and 23 percent of men are afraid of disagreement with partner and angriness with children. What is more, many feel at risk with a partner (55 percent among women vs. 27 percent among men). Hence, the relationship between men and women appears much more confrontational in coffee-growing areas.

Finally, in coffee-growing areas, access to the mobile phone and the internet is much less common than in the cocoa-growing areas.

TABLE 1-A:

Role of Partner in Cocoa-Growing Areas

	FEMALE (SELECTED WOMAN)		MALE (PARTNER)		DIFF
	Mean	N	Mean	N	p-value
Has a partner:					
Currently	91.3	551	100.0	418	0.000
In the past	8.7	551	0.0	418	0.000
Asks Permission from Partner to Go To:					
The market	78.8	551	58.6	418	0.000
The health center	79.3	551	65.3	418	0.000
The community center, neighbourhood park	77.1	551	61.5	418	0.000
A place of worship	63.0	551	52.2	418	0.001
Visit relatives in the neighbourhood	73.3	551	61.7	418	0.000
Visit friends in the neighbourhood	69.3	551	60.0	418	0.003
Partners Agree On:					
Religion	91.7	551	93.8	418	0.203
Politics	76.0	551	81.1	418	0.056
Family	90.7	551	94.5	418	0.024
Friends	75.1	551	77.0	418	0.492
Money	88.7	551	93.5	418	0.008
House work	69.7	551	72.0	418	0.431
Work	86.2	551	92.6	418	0.001
Moral rules	78.6	551	79.4	418	0.750
Relationship between parents and children	87.8	551	92.8	418	0.008
Education of children	90.9	551	95.5	418	0.004

	FEMALE (SELECTED WOMAN)		MALE (PARTNER)		DIFF
	Mean	N	Mean	N	p-value
Consult partner to buy clothes	83.8	551	81.8	418	0.409
Consult partner for children-based purchases	85.8	551	90.0	418	0.050
Afraid to disagree with partner, angry with you	34.8	551	22.2	418	0.000
Afraid to disagree with partner, angry with your children	18.3	551	9.1	418	0.000
Found at risk with partner	26.7	551	9.3	418	0.000
Has her/his own phone	38.8	551	60.5	418	0.000
Partner pays for the phone services	8.9	214	3.2	253	0.011
Access to the internet	5.1	551	6.7	418	0.294
Internet Access:					
At work	14.3	28	32.1	28	0.112
At home	53.6	28	60.7	28	0.595
In a relative's house	0.0	28	0.0	28	-
In a friend's house	0.0	28	0.0	28	-
In an Internet cafe	0.0	28	0.0	28	-
With cellphone	64.3	28	53.6	28	0.421
Other	0.0	28	0.0	28	-

Sources: PPAP Survey, 2017.

TABLE 1-B

Role of Partner in Coffee-Growing Areas

	FEMALE (SELECTED WOMAN)		MALE (PARTNER)		DIFF
	Mean	N	Mean	N	p-value
Has a partner					
Currently	88.5	392	100.0	244	0.000
In the past	11.5	392	0.0	244	0.000
Ask Permission to Partner to Go To:					
The market	51.8	392	29.9	244	0.000
The health center	56.4	392	36.9	244	0.000
The community center, neighbourhood park	49.0	392	29.1	244	0.000
A place of worship	42.6	392	34.0	244	0.029
Visit relatives in the neighbourhood	53.6	392	27.9	244	0.000
Visit friends in the neighbourhood	54.3	392	26.2	244	0.000
Partners agree on:					
Religion	89.0	392	90.2	244	0.648
Politics	64.8	392	71.3	244	0.084
Family	90.3	392	89.8	244	0.822
Friends	70.7	392	68.0	244	0.486
Money	88.3	392	91.0	244	0.268
House work	75.8	392	68.9	244	0.060
Work	80.9	392	83.6	244	0.377
Moral rules	79.6	392	80.7	244	0.724
Relationship between parents and children	83.2	392	84.0	244	0.777
Education of children	90.6	392	92.6	244	0.356

	FEMALE (SELECTED WOMAN)		MALE (PARTNER)		DIFF
	Mean	N	Mean	N	p-value
Consult partner to buy closes	66.6	392	47.1	244	0.000
Consult partner for children purchases	76.0	392	58.6	244	0.000
Afraid to disagree with partner, angry with you	57.1	392	30.7	244	0.000
Afraid to disagree with partner, angry with your children	34.9	392	23.4	244	0.001
Found at risk with partner	54.8	392	27.0	244	0.000
Has her/his own phone	13.8	392	33.6	244	0.000
Partner pays for the phone services	5.6	54	1.2	82	0.199
Access to the internet	1.8	392	2.5	244	0.574
Internet Access:					
At work	14.3	7	33.3	6	0.454
At home	14.3	7	50.0	6	0.178
In a relative's house	0.0	7	0.0	6	-
In a friend's house	0.0	7	0.0	6	-
In an Internet café	0.0	7	0.0	6	-
With cellphone	85.7	7	83.3	6	0.914
Other	0.0	7	0.0	6	-

Sources: PPAP Survey, 2017.

Tables 2-A and 2-B display the problems and decision making within the family in both cocoa and coffee-growing areas.

COCOA-GROWING AREAS

In general, the main problems in the last two years were lack of money (for 39.7 percent of women and 42.1 percent of men) and illness of a member (around 33 percent among both men and women). The absence of father is high for women (24.5 percent), but not for men (4.1 percent), whereas the absence of mother is significantly higher for men (10.5 percent) than for women (2.7 percent). Alcoholism of a member, domestic violence, and addiction of a member are significantly more of a problem according to women (respectively 22.0 percent, 10.5 percent, and 3.8 percent) than according to men (respectively 10.5 percent, 6.7 percent and 1.7 percent).

Decision making within the household is also perceived differently according to women and men. In most cases, partners take decisions together. However, it is interesting to note that according to women, they are more likely than men to make decisions alone (8 percent of women and 0 percent of men). Whereas perceptions of both women and men concerning women decisions are rarely statistically significantly different (except for spending on food and toiletries), they are significantly different when we consider women's partner decisions (except taking the kids to play or having how many children).

COFFEE-GROWING AREAS

In coffee-growing areas, family problems are more common than in cocoa-growing areas, in particular: bad relationship between parents and children (28 percent according to women, 22 percent according to men), lack of money (resp. 76 percent and 79 percent), and domestic violence (40 percent both for women and men).

Moreover, even if the perceptions are different between men and women, the latter seem less able to make decisions than in the cocoa-growing areas (in 78 percent of cases woman decides, against 85 percent in cocoa-growing areas). However, according to women, a greater proportion of them make decisions alone (12 percent), whereas only a few men do (1 percent).

Violence levels are higher in the Highlands in general, so the differences may reflect cultural differences between different geographical areas and ethnic groups.

TABLE 2-A

Problems and Decision Making within the Family (from the Selected Woman Side) in Cocoa-Growing Areas

	FEMALE (SELECTED WOMAN)		MALE (PARTNER)		DIFF
	Mean	N	Mean	N	p-value
Problem in Family in the Last Two Years					
Bad relationship between parents and children	6.9	551	5.0	418	0.218
Lack of money	39.7	551	42.1	418	0.460
Alcoholism of a member	22.0	551	10.5	418	0.000
Illness of a member	33.4	551	33.0	418	0.901
Lack of work of a member	18.3	551	20.6	418	0.384
Absence of the father	24.5	551	4.1	418	0.000
Absence of the mother	2.7	551	10.5	418	0.000
Lack of time	14.0	551	14.4	418	0.867
Addiction of a member	3.8	551	1.7	418	0.038
Domestic violence	10.5	551	6.7	418	0.033
Imprisonment of a member	1.6	551	0.7	418	0.178
Infidelity	1.5	551	1.2	418	0.729
Interference from other families in your relationship	12.5	551	11.0	418	0.466
Woman's Partner Decides					
Buy durable household goods	89.3	551	98.6	418	0.000
How much to spend on food and toiletries	82.2	551	89.2	418	0.002
Arrange/decorate the house	68.1	551	74.2	418	0.037
Send the children to school	77.5	551	84.0	418	0.010
Take children to medical checks	73.9	551	79.7	418	0.033
Take the children to the doctor when sick	76.0	551	84.0	418	0.002
If you must work outside the home or not	73.7	551	83.7	418	0.000
Having how many children	76.6	551	80.9	418	0.106
Take the kids to play	41.6	551	44.5	418	0.361

	FEMALE (SELECTED WOMAN)		MALE (PARTNER)		DIFF
	Mean	N	Mean	N	p-value
Woman Decides					
Buy durable household goods	95.3	551	94.5	418	0.585
How much to spend on food and toiletries	96.7	551	98.8	418	0.025
Arrange/decorate the house	93.6	551	95.9	418	0.108
Send the children to school	86.6	551	88.0	418	0.495
Take children to medical checks	90.0	551	88.8	418	0.529
Take the children to the doctor when sick	90.9	551	91.9	418	0.604
If you must work outside the home or not	79.9	551	76.6	418	0.220
Having how many children	79.1	551	81.1	418	0.446
Take the kids to play	51.0	551	47.8	418	0.331

Sources: PPAP Survey, 2017.

TABLE 2-B

Problems and Decision Making within the Family (from the Selected Woman Side) in Coffee-Growing Areas

	FEMALE (SELECTED WOMAN)		MALE (PARTNER)		DIFF
	Mean	N	Mean	N	p-value
Problem in Family in the Last Two Years					
Bad relationship between parents and children	28.1	392	22.1	244	0.090
Lack of money	75.8	392	78.7	244	0.391
Alcoholism of a member	16.1	392	8.6	244	0.004
Illness of a member	30.9	392	38.1	244	0.063
Lack of work of a member	17.9	392	18.4	244	0.853
Absence of the father	19.1	392	5.3	244	0.000
Absence of the mother	1.5	392	6.1	244	0.005
Lack of time	16.3	392	24.2	244	0.018
Addiction of a member	4.1	392	7.0	244	0.132
Domestic violence	39.8	392	39.8	244	0.992
Imprisonment of a member	0.8	392	1.6	244	0.345
Infidelity	2.3	392	0.4	244	0.029
Interference from other families in your relationship	21.2	392	20.1	244	0.741
Woman's Partner Decides					
Buy durable household goods	79.6	392	93.0	244	0.000
How much to spend on food and toiletries	69.6	392	77.5	244	0.028
Arrange/decorate the house	54.6	392	57.0	244	0.558
Send the children to school	81.6	392	90.2	244	0.002
Take children to medical checks	62.2	392	68.4	244	0.108
Take the children to the doctor when sick	70.2	392	76.6	244	0.069
If you must work outside the home or not	48.2	392	61.1	244	0.001
Having how many children	84.7	392	93.0	244	0.001
Take the kids to play	20.9	392	28.7	244	0.029

	FEMALE (SELECTED WOMAN)		MALE (PARTNER)		DIFF
	Mean	N	Mean	N	p-value
Woman Decides					
Buy durable household goods	88.8	392	83.2	244	0.053
How much to spend on food and toiletries	91.6	392	86.5	244	0.050
Arrange/decorate the house	88.3	392	84.8	244	0.224
Send the children to school	91.6	392	91.4	244	0.934
Take children to medical checks	82.1	392	82.8	244	0.835
Take the children to the doctor when sick	92.6	392	96.3	244	0.039
If you must work outside the home or not	55.9	392	59.0	244	0.435
Having how many children	80.1	392	84.0	244	0.207
Take the kids to play	29.6	392	37.3	244	0.046

Sources: PPAP Survey, 2017.

3.3. ACTIVITIES, LABOR AND TIME-USE

Trends in activities (frequencies and working days) are described in Appendices C and D. The focus here is on hours of work. Tables 3-A and 3-B present daily activity frequencies, number of hours for individuals participating in a given activity, and number of hours all individuals combined (participating or not) using data from the time-use module.

Activities are grouped into seven categories:

- Personal care (Sleeping and resting, Eating, and Personal care);
- Formal work (Work as an employee);
- Primary production (Cocoa field work, Cocoa processing, Other farming, Animal rearing, and Fishing);
- Non-primary production (Own business work: non-agriculture or livestock);
- Domestic services and care (Shopping/getting services, Sewing, weaving, other textile care, Cooking, Other domestic work: washing, cleaning, Care for children, and Care for adults/elderly);
- Learning activities (School or homework); and
- Other non-productive / leisure activities (Commuting/Travelling, Watching TV, Listening Radio, Reading, Sitting with family, Sports, Social visits, Practicing hobbies, Ceremony, Others, and Election).

Box 3-E provides the main findings for cocoa-growing areas.

COCOA-GROWING AREAS

BOX 3-E:

Activities, Labor and Time-Use in Cocoa-Growing Areas

+ Primary production concerns about 44 percent of men and 37 percent of women in cocoa-growing areas, with a statistically significant difference between who spends their time doing what activities. The largest gap is for domestic services and care activities with women doing considerably more work in this area.
+ Women tend to do more multi-tasking. This is why the total number of hours per day added up to 26.9 hours for women and 25.4 hours for men.
+ Women work on average 2.8 hours more in domestic activities than men. When considering only agricultural or non-agricultural production activities and formal work, it is men who work more than women, about 1.4 hours on average per day.

COFFEE-GROWING AREAS

Half of all women and men are involved in primary production. A quarter of women are involved in coffee field work and a larger proportion in farming work. Domestic services and care activities are also a priority for women (78 percent for women vs. 28 percent for men). Women also spend less time on non-productive and leisure activities compared to men in both cocoa and coffee-growing areas (Figures 3-A and 3-B).

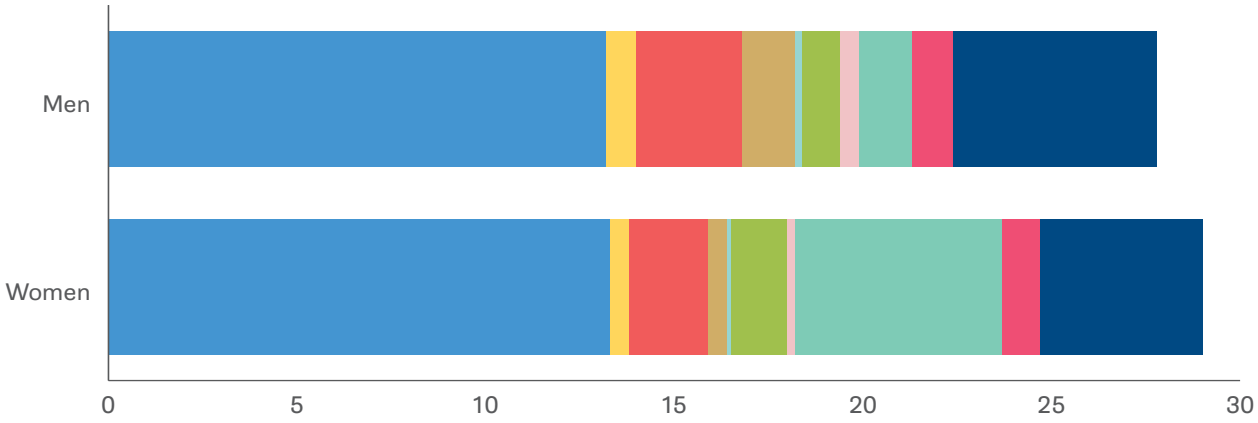
Age and gender have some effect on the total time spent on each activity (Figures 3-C for cocoa and 3-E for coffee). Regarding primary production and formal work, we detect significant differences in the hours per day spent on work by gender. In cocoa-growing areas, females spend fewer hours working for formal work or primary production than males at all ages. In addition, we find a much flatter age profile for females than for males, reflecting the lower labor force participation of females, even at young ages. However, older adults gradually reduce their time spent doing domestic work before reaching 65 years old. In coffee-growing areas, while age-profiles of time-use are very similar to those in cocoa-growing areas, women generally declare they work fewer hours for domestic services and care.

There is a minor relationship between household asset wealth and total time spent on each activity by gender and areas (Figures 3-D for cocoa and 3-F for coffee[2]) In cocoa-growing areas, we find that profiles are relatively flat for both males and females. Time spent on primary production is slightly lower among richer men although it might not be statistically significant. In coffee-growing areas, time spent for domestic services and care is increasing among women. This latter observation might be due to social status determinants - women work less outside when they get richer (Eswaran et al. 2013).

2. Asset wealth index is obtained from multiple component analysis (first component of the analysis is used) which is presented in Table B1-1 for cocoa and Table B2-1 for coffee (see Box 1 and Appendix B).

FIGURE 3-A

The 'Average Day' for Men and Women (Hours per Activity) in Cocoa-Growing Areas



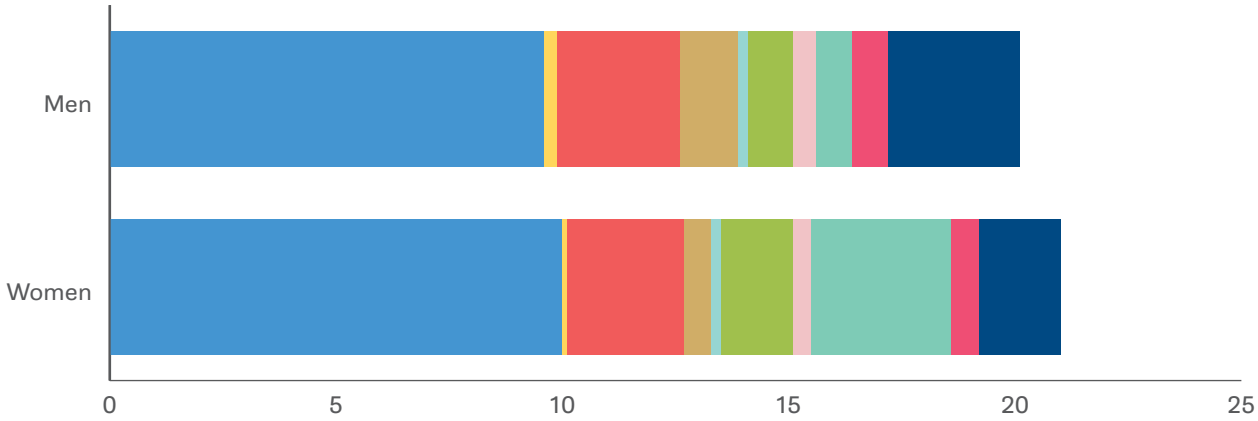
	Women	Men
Personal care	13.3	13.2
Formal work	0.5	0.8
Primary production	2.1	2.8
Coffee field work	0.5	1.4
Coffee processing	0.1	0.2
Other farming	1.5	1.0
Non-primary production	0.2	0.5
Domestic services and care	5.5	1.4
Learning activities	1.0	1.1
Other non-productive / leisure activities	4.3	5.4

Sources: PPAP Survey, 2017.

Note: total hours can be more than 24 due to secondary activity.

FIGURE 3-B

The 'Average Day' for Men and Women (Hours per Activity) in Coffee-Growing Areas



	Women	Men
Personal care	10.0	9.6
Formal work	0.1	0.3
Primary production	2.6	2.7
Coffee field work	0.6	1.3
Coffee processing	0.2	0.2
Other farming	1.6	1.0
Non-primary production	0.4	0.5
Domestic services and care	3.1	0.8
Learning activities	0.6	0.8
Other non-productive / leisure activities	1.8	2.9

Sources: PPAP Survey, 2017.

Note: total hours can be less than 24 due to misreported activity.

TABLE 3-A

Daily Activities: Frequencies and Number of Hours in Cocoa-Growing Areas

	FEMALE		MALE		DIFF
	Mean	N	Mean	N	p-value
Personal Care					
Frequency (%)	99.6	1077	99.9	1154	0.164
Number of hours	13.4	1073	13.3	1153	0.394
Frequency x Number of hours	13.3	1077	13.2	1154	0.561
Formal Work					
Frequency (%)	5.6	1077	9.3	1154	0.001
Number of hours	8.2	60	8.7	107	0.181
Frequency x Number of hours	0.5	1077	0.8	1154	0.000
Primary Production					
Frequency (%)	36.9	1077	43.5	1154	0.001
Number of hours	5.6	397	6.4	502	0.000
Frequency x Number of hours	2.1	1077	2.8	1154	0.000
Cocoa Field Work					
Frequency (%)	8.4	1077	25.7	1154	0.000
Number of hours	5.7	91	5.6	297	0.888
Frequency x Number of hours	0.5	1077	1.4	1154	0.000
Cocoa Processing					
Frequency (%)	1.4	1077	3.7	1154	0.000
Number of hours	4.7	15	4.8	43	0.881
Frequency x Number of hours	0.1	1077	0.2	1154	0.001
Other Farming					
Frequency (%)	28.9	1077	17.4	1154	0.000
Number of hours	5.1	311	5.6	201	0.043
Frequency x Number of hours	1.5	1077	1.0	1154	0.000

	FEMALE		MALE		DIFF
	Mean	N	Mean	N	p-value
Non-Primary Production					
Frequency (%)	3.7	1077	8.6	1154	0.000
Number of hours	5.3	40	6.2	99	0.060
Frequency x Number of hours	0.2	1077	0.5	1154	0.000
Domestic Services and Care					
Frequency (%)	78.3	1077	34.0	1154	0.000
Number of hours	7.1	843	4.2	392	0.000
Frequency x Number of hours	5.5	1077	1.4	1154	0.000
Learning Activities					
Frequency (%)	13.8	1077	15.0	1154	0.437
Number of hours	7.4	149	7.4	173	0.800
Frequency x Number of hours	1.0	1077	1.1	1154	0.414
Other Non-Productive / Leisure Activities					
Frequency (%)	77.1	1077	81.5	1154	0.011
Number of hours	5.5	830	6.7	940	0.000
Frequency x Number of hours	4.3	1077	5.4	1154	0.000

Sources: PPAP Survey, 2017.

TABLE 3-B

Daily Activities: Frequencies and Number of Hours in Coffee-Growing Areas

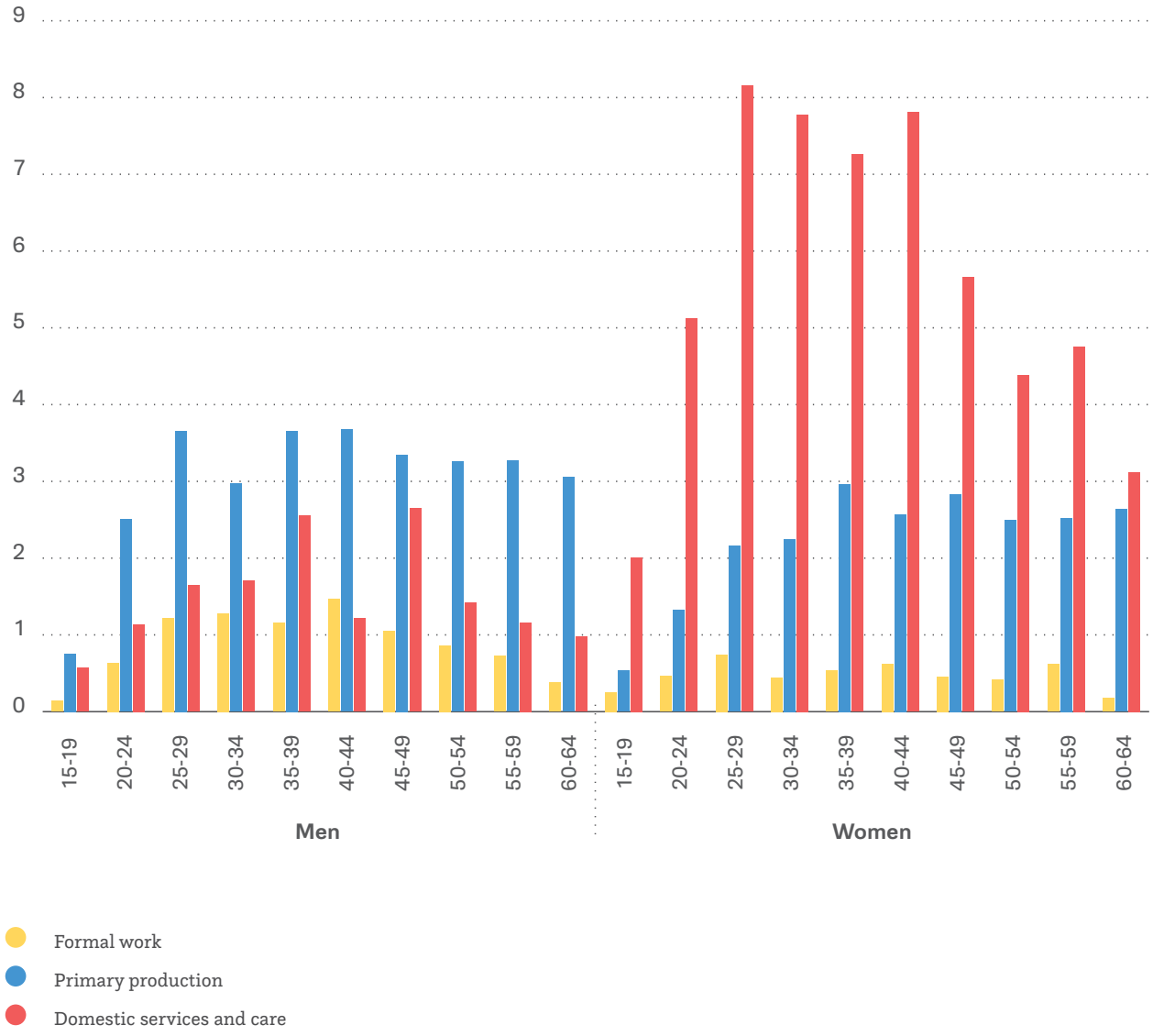
	FEMALE		MALE		DIFF
	Mean	N	Mean	N	p-value
Personal Care					
Frequency (%)	99.3	738	99.3	917	0.954
Number of hours	10.1	733	9.7	911	0.066
Frequency x Number of hours	10.0	738	9.6	917	0.073
Formal Work					
Frequency (%)	1.1	738	4.5	917	0.000
Number of hours	5.0	8	6.7	41	0.223
Frequency x Number of hours	0.1	738	0.3	917	0.000
Primary Production					
Frequency (%)	52.4	738	51.4	917	0.663
Number of hours	4.9	387	5.3	471	0.088
Frequency x Number of hours	2.6	738	2.7	917	0.367
Cocoa Field Work					
Frequency (%)	13.3	738	33.0	917	0.000
Number of hours	4.2	98	3.9	303	0.264
Frequency x Number of hours	0.6	738	1.3	917	0.000
Cocoa Processing					
Frequency (%)	6.2	738	7.7	917	0.229
Number of hours	2.8	46	2.7	71	0.770
Frequency x Number of hours	0.2	738	0.2	917	0.399
Other Farming					
Frequency (%)	45.3	738	31.0	917	0.000
Number of hours	3.5	334	3.2	284	0.101
Frequency x Number of hours	1.6	738	1.0	917	0.000

	FEMALE		MALE		DIFF
	Mean	N	Mean	N	p-value
Non-Primary Production					
Frequency (%)	8.4	738	9.8	917	0.319
Number of hours	4.3	62	5.4	90	0.113
Frequency x Number of hours	0.4	738	0.5	917	0.074
Domestic Services and Care					
Frequency (%)	77.8	738	28.2	917	0.000
Number of hours	3.9	574	2.8	259	0.000
Frequency x Number of hours	3.1	738	0.8	917	0.000
Learning Activities					
Frequency (%)	10.6	738	12.3	917	0.264
Number of hours	5.9	78	6.4	113	0.315
Frequency x Number of hours	0.6	738	0.8	917	0.140
Other Non-Productive / Leisure Activities					
Frequency (%)	52.2	738	61.8	917	0.000
Number of hours	3.4	385	4.6	567	0.000
Frequency x Number of hours	1.8	738	2.9	917	0.000

Sources: PPAP Survey, 2017.

FIGURE 3-C

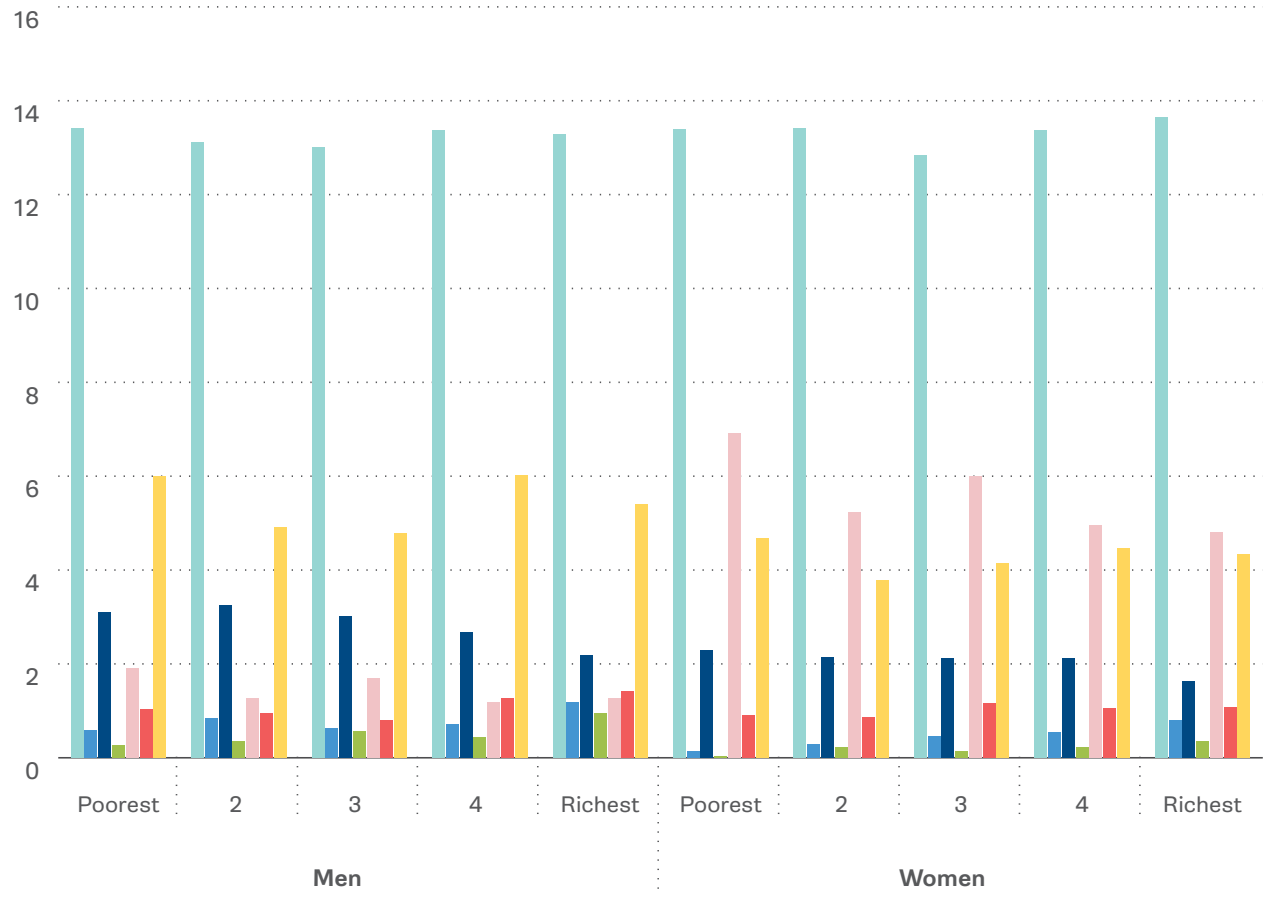
Time Spent on Daily Activities by Age, Gender and Area (in Hours)—Cocoa-Growing Areas



Sources: PPAP Survey, 2017.

FIGURE 3-D

Time Spent on Daily Activities by Asset Wealth Quintiles, Gender and Area (in Hours)—Cocoa-Growing Areas



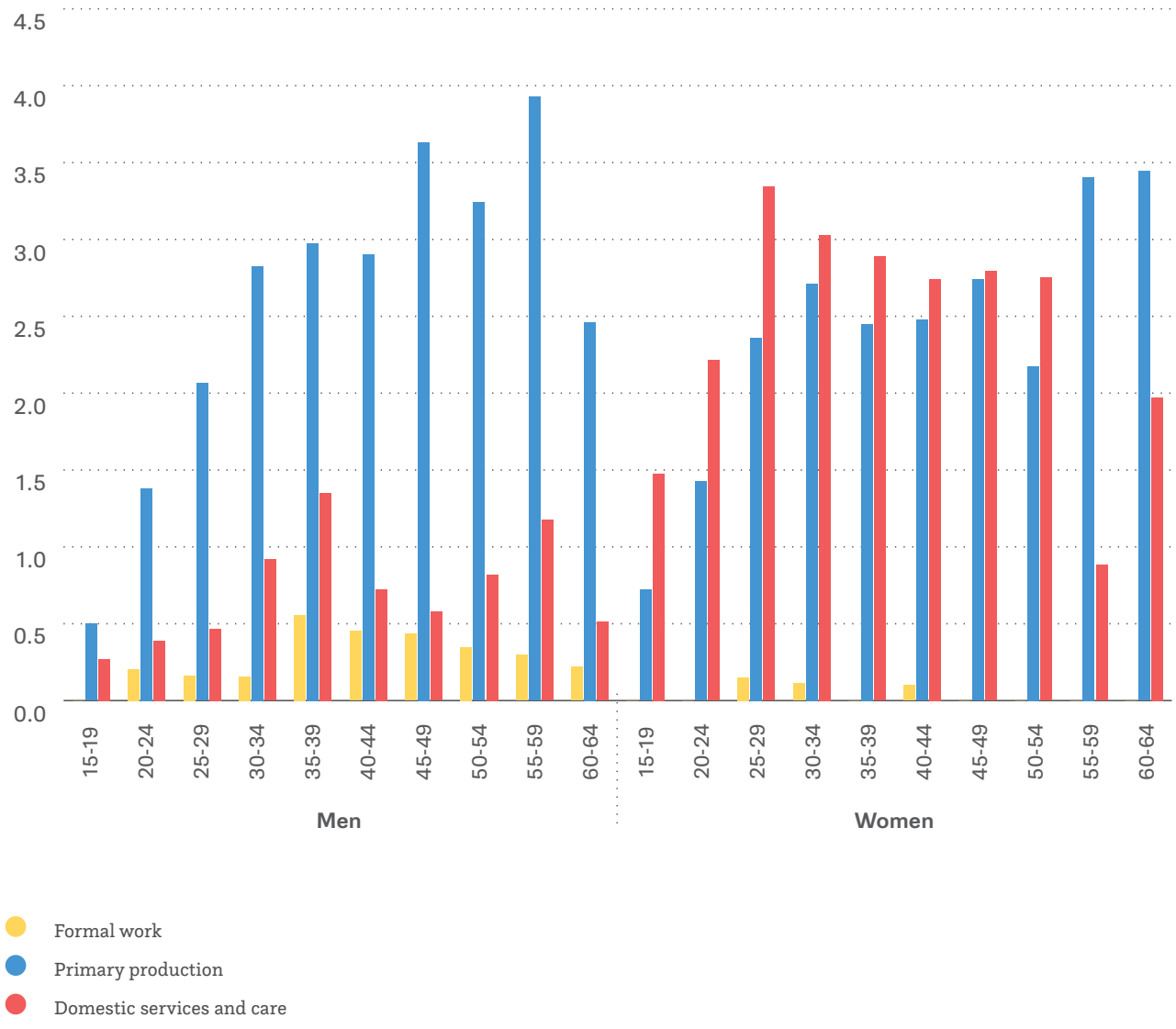
- Personal care
- Formal work
- Primary production
- Non-primary production
- Domestic services and care
- Learning activities
- Other non-productive / leisure activities

Sources: PPAP Survey, 2017.

Note: Asset wealth index is obtained from multiple component analysis

FIGURE 3-E

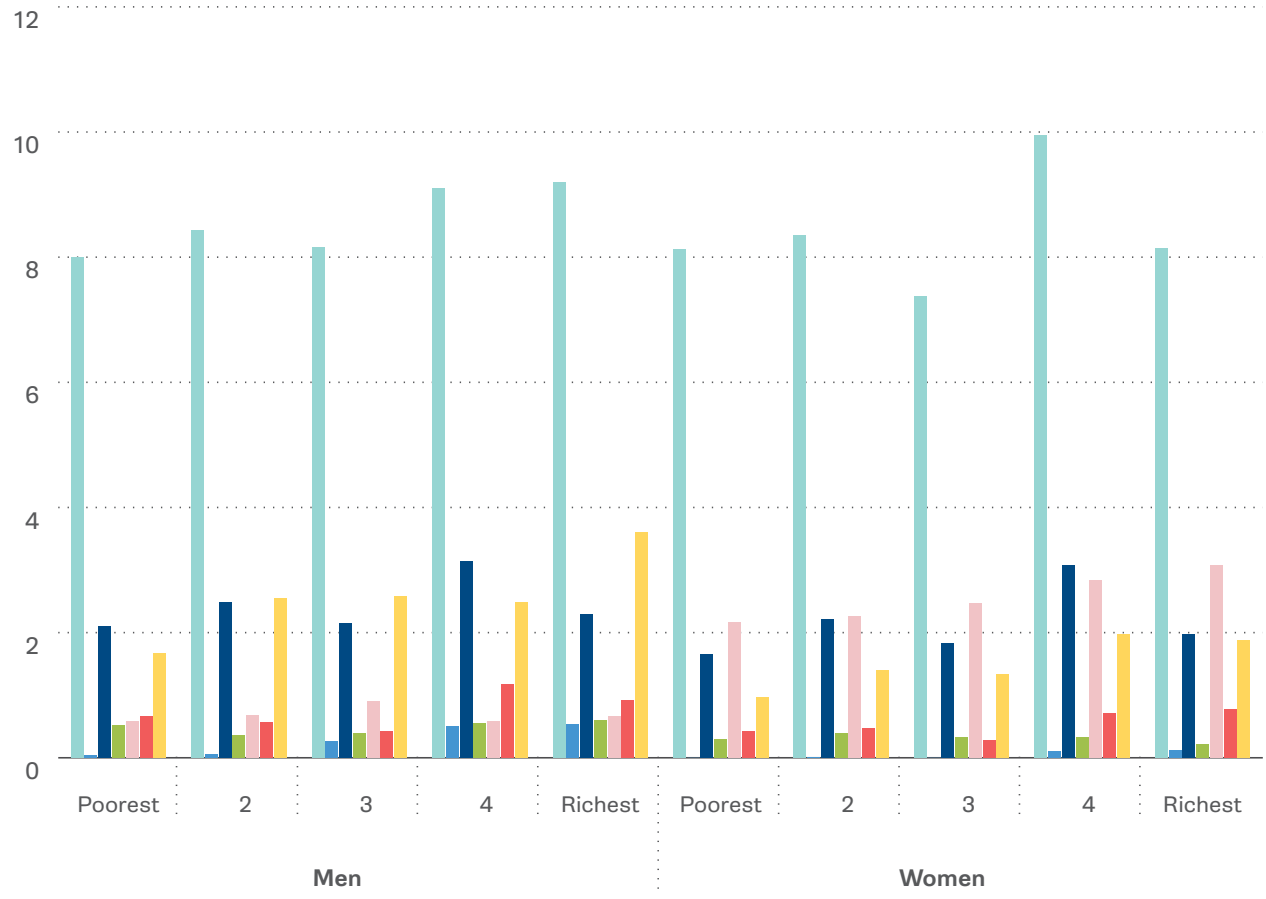
Time Spent on Daily Activities by Age, Gender and Area (in Hours)—Coffee-Growing Areas



Sources: PPAP Survey, 2017.

FIGURE 3-F

Time Spent on Daily Activities by Asset Wealth Quintile, Gender and Area (in Hours)—Coffee-Growing Areas



- Personal care
- Formal work
- Primary production
- Non-primary production
- Domestic services and care
- Learning activities
- Other non-productive / leisure activities

Sources: PPAP Survey, 2017.

Note: Asset wealth index is obtained from multiple component analysis.

Photo: Thomas Pelly/World Bank

4. ASSESSING TIME-USE GENDER DISCRIMINATION

Using an econometric approach makes it possible to decompose the gender gap using an Oaxaca-Blinder type decomposition. The report applies the Oaxaca-Blinder method (Oaxaca 1973) to decompose the observed differential in the daily hours spent by men and women on each of the following four aggregated activities: primary production, other work, domestic work, and other non-productive and leisure activity.

COCOA-GROWING AREAS REGRESSION ESTIMATES

Findings on the effects of different variables on the allocation of time within the household are presented for cocoa in Appendix C using a large set of variables (Tables C-13 and C-14). Main results are as follows (Box 4-A):

BOX 4-A

Cocoa-Growing Areas: Regression Estimates

- Age has generally a negative and significant effect on domestic work and learning hours for women, although not on other time-use variables (either working or leisure time); for men, age has a statistically significant negative effect on total hours of work.
- Years of schooling variable has a positive and significant effect on total hours of work and formal working time, and a negative effect on domestic working time for women; no significant effects can be reported for men.
- Literacy in Pidgin has a negative and significant effect on total hours of work.
- Having access to the internet has a negative and significant effect on total hours of work for women; whereas, for men, it has a positive influence on learning time.
- Being a female head and being married have a negative and significant effect on learning time for women; being married also has a negative effect on domestic work and learning time for men.
- The number of under 12-years-old children increases domestic work for both women and men; it has a negative effect on time allocated to personal care for women; also, it has a positive effect on time allocated to non-primary production for men.
- Other variables such as women's empowerment and decision-making variables are not correlated with allocation of time within the household for women, except that decision index decreases domestic working time (the more women decide the less their domestic work); also, managing a bank account for women has a positive effect on their time allocated to formal work.

Photo: Thomas Perry/World Bank.

COFFEE-GROWING AREAS REGRESSION ESTIMATES

These are presented in Box 4-B.

BOX 4-B

Coffee-Growing Areas: Regression Estimates

+ Effects of age, years of schooling and literacy for women are very similar to those found in cocoa-growing areas; what is more, English literacy has a positive and significant effect on both total hours of work and primary production hours (Tables D-17 and D-18 in Appendix D).
+ The asset wealth index and the participation to PPAP dummy have interesting effects on time-use. Among women, the asset wealth index has a positive and significant effect on total hours of work, primary production, domestic services and personal care. These effects are not statistically significant for men. It appears that PPAP participation has a positive impact on women domestic work.
+ Unlike cocoa-growing areas, many women's empowerment and decision-making variables have statistically significant effects on time-use. In particular, the family problem index has a negative effect on women total hours of work and primary production, while it has a positive effect on formal work and domestic work hours. When women decide, they decrease their domestic work hours, while when men decide, they decrease their total hours of work in particular primary production hours. Women involved in planning and decision making about coffee production has a negative and significant effect on men total hours of work; it is also positively correlated with men domestic work hours.

OAXACA-BLINDER DECOMPOSITION

The results of the Oaxaca-Blinder decomposition of the gender gap are presented in Table 4-A. Differences between males and females in terms of time-use can be explained by various factors, i.e. differences in skills and observable characteristics, or discriminations. Differences in choices or gender-specific constraints (such as family constraints or other social or environmental constraints) are determinants of the time-use gender gap, and may not be observable; they are therefore considered as part of the "unexplained component" of the gender gap. When decomposing the time-use gender gap we obtain two components: gender gap differences due to differences in observed characteristics (characteristics components), and gender gap differences due to differences in unobserved characteristics (returns components).

We analyzed the contribution of the characteristic and return components to the observed gender differential in four daily activities: primary production, other work, domestic work, and non-productive and leisure time. These returns can be interpreted as the different weights assigned to these characteristics in the individual's decision-making process on the time spent on each activity (Table 4-A).

In cocoa-growing areas, the differences in characteristics represent 5.2 percent of the observed differential in time spent on domestic work, whereas in coffee-growing areas it represents 12.0 percent. A large percentage of the observed differential in time spent on other work (i.e. formal work or non-primary production) is explained by differences in returns (97.9 percent and 124.5 percent in cocoa and coffee-growing areas, respectively). The contribution of the return component is 85.1 percent and 96.2 percent of the observed gap in time spent on non-productive activities and leisure in cocoa and coffee-growing areas, respectively. An interpretation of these results is that intra-household decision making ignores the needs and capacities of women (which leads to discrimination and inefficiencies) to the extent that differences in characteristics account for only a small part of the gender gaps. This conclusion is consistent with our results concerning the important contribution of the unexplained (or return) component in the observed time allocation gender gaps.

TABLE 4-A

Decomposition Analysis of the Time-Use Gender Gap

COCOA

	Primary Production	Other Work	Domestic Work	Non-Productive and Leisure
D	0.986	0.954	-5.122	2.053
C	-0.340	0.020	-0.268	0.305
R	1.326	0.933	-4.854	1.748
Contribution (in %):				
C/D	-34.5%	2.1%	5.2%	14.9%
R/D	134.5%	97.9%	94.8%	85.1%
Total	100.0%	100.0%	100.0%	100.0%

COFFEE

	Primary Production	Other Work	Domestic Work	Non-Productive and Leisure
D	0.728	0.397	-2.645	1.818
C	0.068	-0.097	-0.318	0.070
R	0.660	0.495	-2.327	1.749
Contribution (in %):				
C/D	9.4%	-24.5%	12.0%	3.8%
R/D	90.6%	124.5%	88.0%	96.2%
Total	100.0%	100.0%	100.0%	100.0%

Sources: PPAP Survey, 2017. Note: D (Observed difference), C (Characteristics), R (Returns).

Photo: Thomas Perry/World Bank.

Photo: PPAP, PNG

5. ASSESSING THE IMPACT OF TIME ALLOCATION AND OTHER VARIABLES ON HOUSEHOLD PRODUCTION AND WELFARE

A linear regression model can be a useful method to analyze correlations and a powerful tool for causality analysis with non-experimental data.[3]

Table 5-A presents the dependent variables and explanatory variables introduced in the regression model. In order to give some structure to the analysis, hypothesis are provided concerning the expected effect of the explanatory variables (as seen below).

It merits attention that the survey sample is made up of PPAP households and non-participating households (Box 5-A).

3. For applying the regression methods with experimental data, see Imbens and Rubin (2015).

TABLE 5-A

Dependent variables and explanatory variables introduced in the regression model

VARIABLE TYPE	VARIABLE CATEGORY	NAME OF VARIABLE	MEASUREMENT UNIT	REFERENCE YEAR IN SURVEY	INTERPRETATION OF CAUSALITY
Dependent variable	Household production	Yield of cocoa	Kg/ha	2016	
		Yield of coffee	Kg/ha	2016	
		Income per tree	Kina	2016	
		Number of trees	Tree	2016	
		Quality of pruning	Very well pruned (binary 0 or 1)	2016	
	Household well-being	Income per capita (log)	Kina	2016	
		Welfare scale today	Scale from 1 the poorest to 10 the richest	2016	
		Welfare scale five years ago	Scale from 1 the poorest to 10 the richest	2016	
		Welfare scale in five years	Scale from 1 the poorest to 10 the richest	2016	
Explanatory variable	Economic	Share of total income earned from alternative crops	Percentage	2011	A proxy for the shares of income earned by women which is not observable; women's empowerment positive effect expected
		Asset wealth index	Composite index (0 to 1)	2017	Positive wealth effect
	Bargaining power	Age	Years	2017	Age is a proxy for experience and information; it can increase bargaining power
		Hours of domestic work	Number of hours per day	2017	Women's empowerment negative effect

VARIABLE TYPE	VARIABLE CATEGORY	NAME OF VARIABLE	MEASUREMENT UNIT	REFERENCE YEAR IN SURVEY	INTERPRETATION OF CAUSALITY
		Hours wage of outsiders	Kina	2017	Increasing opportunity cost can increase bargaining power
		Permission index	Composite index (0 to 1)	2017	This index is negatively correlated with bargaining power
	Cooperation	Marriage or common law	Binary variable (0 or 1)	2017	Marriage can imply more cooperation and efficiency
		Agreement index	Composite index (0 to 1)	2017	More cooperation and efficiency
		Family problem index	Composite index (0 to 1)	2017	Less cooperation and efficiency
	Decision making	Decision index	Composite index (0 to 1)	2017	Women's empowerment positive effect
		Involved in planning and decision making of cocoa/coffee production	Binary variable (0 or 1) (household level variable)	2017	Women's empowerment positive effect
		Female primarily involved in selling cocoa/coffee	Binary variable (0 or 1) (household level variable)	2017	Women's empowerment positive effect
		Female primarily involved in receiving payment	Binary variable (0 or 1) (household level variable)	2017	Women's empowerment positive effect
		Female manage account	Binary variable (0 or 1) (household level variable)	2017	Women's empowerment positive effect
	Cognitive skills	Years of schooling; literacy	Years; Binary variable (0 or 1)	2012	Better knowledge and information increase efficiency

VARIABLE TYPE	VARIABLE CATEGORY	NAME OF VARIABLE	MEASUREMENT UNIT	REFERENCE YEAR IN SURVEY	INTERPRETATION OF CAUSALITY
		Age	Years	2017	Experience and information increase efficiency
		Training	Binary variable (0 or 1)	2017	Knowledge positive effect
		Access to information	Binary variable (0 or 1)	2017	Information positive effect
		Phone, internet	Binary variable (0 or 1)	2017	Technology positive effect
	Other non-economic variables	Live in ARB	Binary variable (0 or 1)	2017	Matrilineality effect (women's empowerment negative effect expected)
		Threat of violence	Binary variable (0 or 1)	2017	Low cooperation negative effect
		Participation to community organization	Categorical variable	2017	Network positive effect
		Participation to PPAP	Binary variable (0 or 1)	2016	Multiple positive effects of the project (see Box 2)
		Female head	Binary variable (0 or 1)	2017	Agency effect
		Living in (Province)	Binary variable (0 or 1)	2017	Control variable
		Number of family members	Continuous variable	2017	Control variable

BOX 5-A

PPAP Design and Variables

+ The survey sample is made up of PPAP households and non-participating households. It is therefore important to know what elements in the design of the PPAP can reform or reinforce the status quo for women in agriculture.

+ The Development Objective of the PPAP is to improve the livelihoods of smallholder cocoa and coffee producers supported by the project. This would be achieved through strengthening industry coordination and institutions, facilitating linkages between smallholder farmers and agribusiness for the provision of technologies and services, and through the provision of critical market access infrastructure. Key outcomes of the PPAP are that:

    - Smallholder farmers adopt efficient, market responsive and sustainable production practices leading to an increase in their income;
    - Demand-driven productive partnerships are scaled-up with public support; and
    - Key infrastructure bottlenecks in the targeted value chains are addressed.

+ One of the key objectives of PPAP is that women contribute more to increases in household income through involvement in improved farming practices, processing and marketing. For that purpose, access to training and information have been provided through the project on production, prices, pest and disease management, and other agricultural livelihoods related information. The project also serves as a vehicle for improving literacy among project supported cocoa and coffee farmers and helps to strengthen farmers' ability to operate farm businesses efficiently.

COCOA-GROWING AREAS

The main findings are as follows (Box 5-B).

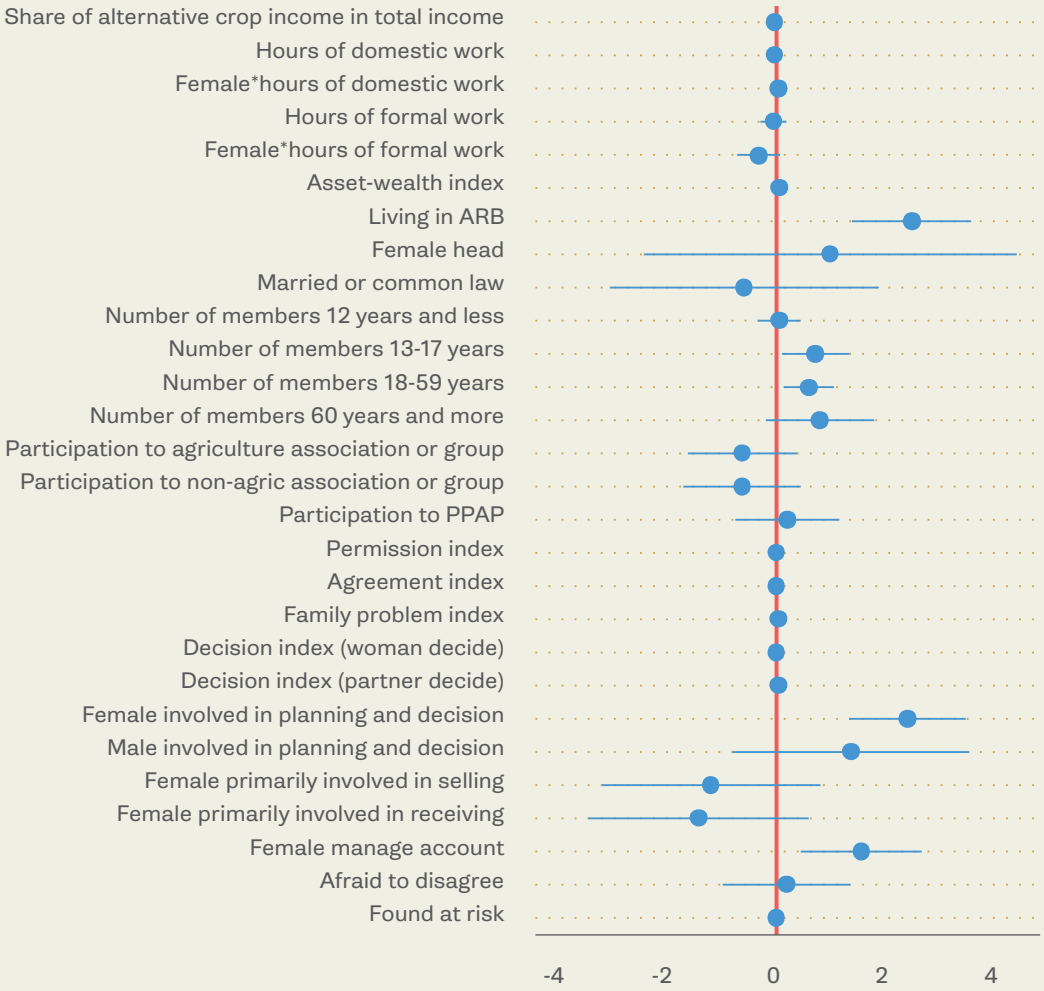
BOX 5-B

Estimation Results for Household Cocoa Production Variables

+ Yield of cocoa (kg/ha dry bean equivalent) has only a few significant determinants; surprisingly, the family problem index has a positive impact on yield and having a male primarily involved in the planning and decision making about cocoa production and a female managing account also have positive effects on yield of cocoa. This might be viewed as contradictory when trying to interpret the results in terms of incentives and bargaining power within the household.
+ When considering other production dependent variables, different variables appear to be significant: the asset wealth index has a positive and significant effect on cocoa income per tree, the same as the number of family members aged 13-69-years-old, living in ARB, having a female involved in planning and a female managing the account. Hence, bargaining power of women and the availability of labor seem to have significantly positive impacts on this indicator of cocoa production yield.
+ The number of trees in cocoa production is also impacted positively and significantly by household asset wealth and living in ARB. Participation in the agricultural group and participation in PPAP also have significant positive impacts. Concerning decision making within the household, male (partner) decision and having a female involved in planning have both negative and significant effects on the number of trees, whereas male involved in planning has a positive and significant impact (Figure 5-A).
+ The quality of pruning is impacted positively and significantly by hours of formal work, asset wealth index, number of 13-17-years-old household members, participation to agricultural association or group and participation to PPAP, and also family problem index. However, this latter variable may be an indication that cocoa income induced by higher quality can raise family problems, thus causality still needs to be ascertained (Figure 5-B).

FIGURE 5-A

Correlates of Cocoa Income Per Tree



Source: PPAP Survey, 2017

Note: OLS regression coefficient estimates and 95%confidence intervals.

FIGURE 5-B

Correlates of Cocoa Quality of Pruning

Source: PPAP Survey, 2017

Note: OLS regression coefficient estimates and 95%confidence intervals.

FIGURE 5-C

Correlates of Coffee Income Per Tree

Source: PPAP Survey, 2017

Note: OLS regression coefficient estimates and 95%confidence intervals.

FIGURE 5-D

Correlates of Coffee Quality of Pruning

Source: PPAP Survey, 2017

Note: OLS regression coefficient estimates and 95%confidence intervals.

COFFEE-GROWING AREAS

Figures 5-C and 5-D on the previous pages present regression results for household coffee production variables. Income per tree is increasing with the number of 18-59-year-old members and women decision index. Agreement index and family problem index both have a negative and significant effect on income per tree. The very good quality of pruning is positively correlated with household size. Female involved in planning and decision also has a negative effect on pruning, while female involved in receiving payment for coffee has a positive effect.

COCOA-GROWING AREAS

Box 5-C provided the main findings for cocoa-growing areas

BOX 5-C

Cocoa-growing areas: main findings

+ Household income per capita has many statistically significant determinants. The income share of alternative crop has a negative and significant effect, while the effect of the number of hours of formal work appears to be positive. Other positive effects concern: asset wealth, living in ARB, and male decision index, female selling cocoa, and female managing account. When a woman is more in control of the sale of cocoa and the management of money that comes from it, there is an increase in income and household welfare. The man can have an important power of decision making within the household, in so far as it improves the yield of agricultural production (farm income, and more specifically cocoa income per tree). Other variables have a significant negative effect on per capita total household income: female head, household size, permission index, male involved in planning, female involved in receiving payments, and afraid to disagree.
+ The welfare scale today is positively and significantly impacted by hours of domestic work (although negatively by female hours of domestic work), asset wealth, living in ARB, number of members 60+, and male decision index.
+ Welfare scale five years ago is positively and significantly correlated with asset wealth index, number of members 60+, permission index, agreement index, family problem index, female decision index, female primarily involvement in selling cocoa. It is negatively and significantly correlated with female involvement in planning and female primarily involved in receiving payments.
+ Welfare scale in five years is positively and significantly impacted by hours of domestic work (although negatively by female hours of domestic work), asset wealth, living in ARB, participation to PPAP, family problem index, female primarily involved in selling cocoa. It is negatively and significantly impacted by female primarily involved in receiving payments.

COFFEE-GROWING AREAS

In coffee-growing areas, household income per capita has fairly the same determinants as in cocoa-growing areas, except for women's empowerment and decision-making variables which are not as significant. Among those latter variables, agreement index and women decision index have a positive and significant effect on income per capita, while men decision index (men decide) has a negative and significant impact.

Concerning wealth scale, the share of alternative crop income in total income has a positive and significant effect today and five years ago, but a negative effect in five years. Female hours of formal work also have a negative effect on wealth scale in five years. Among women's empowerment and decision-making variables, permission index has a positive effect on wealth scale today and five years ago, whereas agreement index has a negative effect on wealth scale today, five years ago, and in five years. Family problem index has a negative effect on wealth scale five years ago. Both women decision index and female involved in the planning and decision making about coffee production has a positive effect on wealth scale today, five years ago, and in five years. Males involved in the planning and decision making about coffee production has a negative effect on the wealth scale five years ago.

Photo: Thomas Parry/World Bank.

6. CONCLUSION

The objective of this time-use and gender study was to better understand labor dynamics in the agricultural sector in PNG. This report uses data from two separate modules of the PPAP follow-up survey on time-use and women's empowerment in order to better understand intra-household decision making and the ability of women to allocate their labor to the time-critical tasks of agricultural production, and whether these determinants, among other factors, influence household production and welfare. Main findings are presented in Box 6-A.

BOX 6-A

Main Findings

- Men's work is more geared towards cocoa or coffee production than women who are more employed in other agricultural activities. In the ARB and ENB regions, 47 percent of men and 32 percent of women are self-employed in the cocoa sector, and 16 percent of men and 38 percent of women are self-employed in other agriculture activities. In the Highlands region, 40 percent of men are self-employed in the coffee sector, against only 14 percent of women, while 16 percent of men and 41 percent of women are self-employed in other agriculture activities.
- Men work longer hours in profitable activities, especially cocoa and coffee activities, whereas women are particularly busy with domestic activities. Men are more responsible for profitable activities such as cocoa or coffee, while women have a more diversified schedule, especially with long hours of domestic work. In cocoa and coffee activities, men are also more involved in the tasks that require skills and add more value to production.
- Income per capita and food sufficiency rate is generally higher among households headed by a man, which can be attributed to the fact that men are more involved in profitable activities such as cocoa or coffee production. It is also a consequence of higher education among men than among women.
- There is an important gap between the proportion of household income earned from cocoa and income earned from coffee. In 2016, cocoa represented 19 percent of total household income in the cocoa sector, and it was the main source of income for 47 percent of households, whereas coffee represented 64 percent of income in the coffee sector, and it was the main source of income for up to 83 percent of households.
- Despite the contribution of certain characteristics, such as education and age, to explain gender differences in hours worked, the unexplained part of the gender gap remains the most important. An interpretation is that intra-household decision making ignores the needs and capacities of women (which leads to discrimination and inefficiencies) to the extent that differences in characteristics account for only a small part of the gender gaps.
- Beyond the explanation of time-use gap between men and women, it is important to take into account intra-household decision making processes. This can provide a better understanding of the factors which influence the allocation of time and, more generally, household efficiency.
- More can be learned on non-cooperative behaviors from the analysis of the women's empowerment module. It appears having to ask permission to go to various places remains relatively common in cocoa-growing areas, while it is less so in coffee-growing areas.

+ Higher bargaining power of women and the availability of labor seem to have significant positive impacts on cocoa and coffee production yield. While women's empowerment indices, such as agreement index and family problem index, have a negative effect on yield in coffee areas.

+ In cocoa-growing areas, household income per capita is determined negatively by the income share of alternative crops, while positively by hours of formal work, asset wealth, living in Bougainville, male decision index, female selling cocoa, and female managing household accounts.

  The fact that woman is more in control of the sale of cocoa and the management of money that comes from it can indeed increase income declared and also actual household welfare.

+ In coffee-growing areas, household income per capita has fairly the same determinants as in cocoa-growing areas, except for women's empowerment and decision-making variables which are not as significant. Among those latter variables, agreement index and women decision index have positive and significant effect on income per capita, while men decision index (men decide) has a negative and significant impact.

+ Both women decision index and female involved in planning and decision making about coffee production have positive effects on wealth scale today, five years ago, and in five years.

From these findings it is possible to draw some principal recommendations:

Focus on women's empowerment to improve household welfare outcomes:

The results show that household welfare outcomes are higher when women have more control over the sale of cocoa and the resulting income. They also show that more control and bargaining power of women significantly correlates with better access to a mobile phone and/or the internet, and empowered women are also more likely to have an equal relationship with their male partner, with whom they are not afraid to disagree over household decision making. Given the entrenched nature of intra-household gender dynamics and attitudes in PNG, it is likely that household awareness-raising and training on gender dynamics, and greater responsibilities for women could improve welfare outcomes for all household members.

Reduce the domestic work burden for women before they can engage in more value-added agricultural activities:

Women in PNG carry a substantial burden of domestic work, and are generally primarily responsible for cooking, washing, cleaning, and caring for other household members. This leaves them little time to substantively engage in more value-added agricultural activities. Without a parallel effort to reduce the domestic burden, initiatives that seek to directly engage women in higher value agricultural activities may only result in a greater overall workload for women, as they will be expected to continue their usual tasks as well as take on additional ones. The domestic workload may be reduced by technological interventions to reduce labour inputs, or by a more equal sharing of domestic tasks between household members.

Photo: Stephane Forman/World Bank.

Photo: Stephane Forman/World Bank.

REFERENCES

ACIAR (2017). Improving Livelihoods of Smallholder Families through Increased Productivity of Coffee-based Farming Systems in the Highlands of PNG. Canberra, Australia.

Aguiar, M., Hurst, E., and Karabarbounis, L. (2012). Recent Development in the Economics of Time Use. Annual Review of Economics, 4: 373-397.

Aguiar, M. A., Hurst, E., and Karabarbounis L. (2013). Time Use During The Great Recession. American Economic Review, 103(5): 1664–1696.

Asselin, L-M. (2009). *Analysis of Multidimensional Poverty: Theory and Case Studies*. Springer.

Bardasi, E., and Wodon, Q. (2005). Measuring Time Poverty and Analyzing its Determinants: Concepts and Application to Guinea. In Blackden, C. M., and Wodon, Q. (ed.): Gender, Time Use, and Poverty in Sub-Saharan Africa. World Bank Working Paper No 73.

Becker, D. (1965). A Theory of Allocation of Time. Economic Journal, 75(299): 493-517.

Browning, M., and Chiappori, P.-A. (1998). "Efficient Intra-Household Allocations: A General Characterization and Empirical Tests. Econometrica, 66: 1241-1278.

Carter, M. R., and Katz, E. G. (1997). Separate Spheres and the Conjugal Contract: Understanding the Impact of Gender-Biased Development. In Haddad, L., Hoddinott, and Alderman, H. (ed): Intrahousehold Resource Allocation in Developing Economics: Models, Methods, and Policy. IFPRI, The John Hopkins University Press, Baltimore and London.

Charmes, J. (2015). Time Use Across the World: Findings of a World Compilation of Time Use Surveys. UNDP Human Development Report Office Background Paper.

Chen, Z., and Wooley, F. (2001). A Cournot-Nash Model of Family Decision Making. Economic Journal, 111(474): 722-748.

Chiappori, P.-A. (1988). Rational Household Labor Supply. Econometrica, 56: 63-89.

Chiappori, P.-A. (1992). "Collective Labor Supply and Welfare. Journal of Political Economy, 100: 437-467.

Chiappori, P-A., Donni, O., and Komunjer, I. (2012). Learning from a Piece of Pie. Review of Economic Studies, 79(1): 162-195.

Chiappori, P-A., and Donni, O. (2006). Les modèles non unitaires de comportement du ménage: un survol de la littérature. L'Actualité Economique, Société Canadienne de Science Economique, vol. 82(1): 9-52.

Curry, G. N., and Koczberski, G. (2004). Mobilising Smallholder Labour in Oil Palm Production: Results of the Mobile Card Trial, Hoskins, West New Britain, Papua New Guinea. Department of Social Sciences, Curtin University of Technology.

Curry, G.N., Koczberski, G., Omuru, E. and Nailina, R.S. (2007). Farming or Foraging? Household Labour and Livelihood Strategies amongst Smallholder Cocoa Growers in Papua New Guinea. Perth, Black Swan Press.

Duflo, E., and Udry, C. (2004). Intrahousehold Resource Allocation in Cote d'Ivoire: Social Norms, Separate Accounts and Consumption Choices. NBER Working Paper No. 10498.

Eswaran, M., Ramaswami, B., Wadhwa, W. (2013). Status, Caste, and the Time Allocation of Women in Rural India. Economic Development and Cultural Change, 61 (2): 311-333.

Gronau, R. (1977). Leisure, Home Production, and Work – the Theory of the Allocation of Time Revisited. Journal of Political Economy, 85 (6): 1099-1123.

Haddad, L., and Kanbur, R. (1994). Are Better Off Households More Unequal or Less Unequal? Oxford Economic Papers, 46(3): 445-58.

Hurst, E. (2015). Measuring Time Use in Household Surveys. Journal of Economic and Social Measurement, 40: 151–170.

Imbens, G. W., and Rubin, D. B. (2015). *Causal Inference for Statistics, Social, and Biomedical Sciences: An Introduction*. Cambridge University Press, New York.

Juster, F. T., and Stafford, F. P. (1991). The Allocation of Time: Empirical Findings, Behavioral Models, and Problems of Measurement. Journal of Economic Literature, 29 (2): 471-522.

Khandker, S. R. (1988). Determinants of Women's Time Allocation in Rural Bangladesh. Economic Development and Cultural Change, 37: 111-126.

Lundberg, S. J., and Pollak, R. A. (1993). Separate Spheres Bargaining and the Marriage Market. Journal of Political Economy, 101: 988-1010.

Lundberg, S. J., and Pollak, R.A. (1994). Non-cooperative bargaining models of marriage. American Economic Review Papers and Proceedings, 84: 132-137.

Lundberg, S., and Pollak, R. A. (2001). Efficiency in Marriage. Review of Economics of the Household, 1(3): 153-167.

Lundberg, Pollak and Wales, 1997. Do Husbands and Wives Pool Their Resources? Evidence from the United Kingdom Child Benefit. Journal of Human Resources, 32(3): 463-480.

Murray-Prior, Roy, 2014. IFC Agribusiness PNG: Monpi Coffee Exports and Monpi Cocoa Exports Baseline Study, Draft Final Report, Prepared for International Finance Corporation, AgriBiz RD&E Services, (mimeo).

Oaxaca, R. (1973). Male-Female Wage Differentials in Urban Labor Markets. International Economic Review, 14: 693–709.

Overfield, D. (1998). An Investigation of the Household Economy: Coffee Production and Gender Relations in Papua New Guinea. Journal of Development Studies 38(5): 52-70.

Pollak, R. A. (2012). Allocating Time: Individuals' Technologies, Household Technology, Perfect Substitutes, and Specialization. Annals of Economics and Statistics, 105/106: 75-97.

Pollak, R. A. (2013). Allocating Household Time: When Does Efficiency Imply Specialization? NBER Working Paper 19178.

Quinsumbing, A. R., and Maluccio, J. A. (2000). Intrahousehold Allocation and Gender Relations: New Empirical Evidence from Four Developing Countries. IFPRI, FCND Discussion Papers No. 84.

Seymour, G, Malapit, H., and Quisumbing, A. (2017). Measuring Time Use in Development Settings. Policy Research working paper No. WPS 8147, World Bank, Washington D.C.

Udry, C. (1996). Gender, Agricultural Production, and the Theory of the Household. Journal of Political Economy, 104(5): 1010-1046.

UN. 2004. Guide for Producing Statistics on Time Use. New York.

World Bank (2011). World Development Report 2012: Gender Equality and Development. Washington DC.

World Bank (2012). Papua New Guinea - Country Gender Assessment for the Period 2011-2012. Washington DC.

World Bank Group, (2014). The Fruit of Her Labor: Promoting Gender-Equitable Agribusiness in Papua New Guinea. Washington DC.

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Photo: Thomas Perry/World Bank.

APPENDIX A

SAMPLING FRAME AND DATA QUALITY ASSURANCE

For social surveys of large populations, sample size requirements are generally determined as a proportion of the square root of the population. The formula to determine sample size is: $n=\sqrt{N}*1.5$, where n is the sample number and N is the population number. For the Baseline Survey, this number was 1,200 households in total, considering that smallholders have very small production blocks. A total of 800 households were enumerated across four target provinces for coffee and 400 households across two target provinces for cocoa. The follow-up survey has extended the samples to approximately 1,100 households for coffee and 800 households for cocoa.

The data collection activities were completely separated from the PPAP implementation itself. Furthermore, questionnaire and instructions were not directly provided by the implementation agency. These conditions of independence between management of project implementation and management of data collection are prerequisite for good quality data.

One issue was that Karak University, which provided some of the staff for data collection, was at the same time lead partner in the ENB province. In order to limit the data collection bias, it was decided that the Bougainville teams would take charge of data collection in the communities with Karak University as a lead partner. By doing this, the potential desirability bias has been significantly mitigated.

For data collection, interviewers were hired and supervised in two separate data collection teams (i.e. cocoa and coffee teams). They have participated in the same training meetings and they have carried out the field test of the questionnaires in both areas separately. The pilot survey enabled data collection teams to test the different modules of the evaluation questionnaire (including the time-use and gender module) to improve the formulation of questions, and to test the social acceptability of certain issues. By doing so, this activity highlighted the significant aspects and issues of the survey which needed to be addressed before the data collection phase. In particular, some questions could be excluded if they were considered irrelevant given the objective of the evaluation during the pretest and field test, and if these questions were likely to increase distrust and thus reduce the response rate. Other questions have been reformulated to reflect the country context. Each reformulation has been done during the pretest and throughout the days of the field test that have allowed testing a modified questionnaire each day and, the last day, to get a quasi-final questionnaire.

DATA ENTRY AND QUALITY ASSURANCE

The use of tablets has eased the process and allowed various checks when entering the data during the interviews. This decision should have increased the level of accuracy of the data. Tablets have been tested in the field with the teams of interviewers.

The Computer-Assisted Personal Interviewing is also programmed in a way to automatically skip unnecessary sections. In fact, the skipped questions were not shown to the interviewers, therefore eliminating a risk of an error, and reducing the burden on the interviewer to understand the skips themselves. In addition, multiple choice questions were used allowing only the members of an appropriate age or type to answer. This strongly limits the possible mistakes from interviewers and avoids the necessity of verifying the coherence of such questions.

The only type of errors that can be detected at the end of the Computer-Assisted Personal Interviewing is coherence problems that could not be programed (manual entry errors are still possible but there is no way to detect most of those absent asking the interviewee once more). A few miscellaneous checks of this type have been performed on the database.

Overall, the verification process was a three-step process:

- A quick verification by the supervisor upon receiving the filled questionnaires from tablets;
- A verification program running after each day of entry which outputs a file with a list of errors for verification; and
- Data cleaning which is far less thorough and complex than after manual data collection and data entry of all questionnaires.

DATA CLEANING AND CHECKS

The data cleaning procedure has consisted of various steps for all modules: inconsistency checks, range checks, skip checks and other miscellaneous checks. In particular, various checks have been done:

- The partner of the head must be of the opposing sex (note that this error is mostly correctable with the names);
- Head's children/grandchildren younger than the head + head's parents and grandparents older than the head (no error found of this type);
- Checking if the last completed grade is coherent with the age (some errors might be due to a different interpretation of schools grades);
- No lead partner for control village households (This is, however, a declaration error and thus LP variable can be replaced when we know what are the LPs in the community); and
- Field observation was done on one or more fields for current producers.

The response rate to the questionnaire was relatively high as nearly 92.6 percent of sampled households have answered the questionnaire in cocoa-growing areas (741 households answered the questionnaire out of 800 initially sampled). However, note that new households can be replaced, and among the 400 households initially sampled from the baseline, 315 have the same head, thus 26 were replaced or no longer have the same head of households at the time of the interview in 2017, and 59 were not interviewed (Table A-1).

In coffee-growing areas, the response rate to the questionnaire is relatively low at 67.1 percent (Table A-2). Note that the Jimy district in Jiwaka province was not sampled, which represents 81 baseline households, hence the response rate is, in fact, a bit higher (around 75 percent). Other households initially sampled in the baseline were not found at the time due to the pre-election period in May—June 2017, which has had a much greater impact on households' response rate in the Highlands region. Furthermore, some new controls were added to the planned sample but are not considered here. Among the 529 households who answered the questionnaire (in particular the income section), 509 have the same head.

TABLE A-1

Sample Size and Response Rates in Cocoa-Growing Areas

	Baseline households	New households
Planned/Sampled	400	400
Answered the questionnaire	341 (85.3%)	400 (100.0%)
Answered with the same head as in the baseline	315 (78.8%)	-

Sources: PPAP Cocoa Survey, 2012 (baseline), 2017.

TABLE A-2

Sample Size and Response Rates in Coffee-Growing Areas

	Baseline households	New households
Planned/Sampled	788	151
Answered the questionnaire	529 (67.1%)	151 (100.0%)
Answered with the same head as in the baseline	509 (64.4%)	-

Sources: PPAP Coffee Survey, 2012 (baseline), 2017.

Table A-3 presents results concerning partnerships and participation in cocoa and coffee-growing areas. We observe that only 46.6 percent of households have heard about PPAP in PPAP cocoa-growing areas (of those, 59.1 percent declare having a lead partner under PPAP), and a proportion as low as 18.9 percent in PPAP coffee-growing areas (of those, 12.3 percent declare having a lead partner under PPAP). These individual statements may not reflect the reality of project participation, thus, for PPAP impact assessment, a more "objective" variable can be used based on information gathered prior to data collection on community participation to the PPAP. The PPAP variable used in this report, therefore, concerns the community and not the household specifically.

Table A-3 also indicates that, at the end of interviews, a high percentage of households would be happy to participate in a survey in 2019: 94.2 percent in cocoa-growing areas and 89.8 percent in coffee-growing areas, with no significant difference between PPAP and non-PPAP. This indicates that the questionnaire was relatively well received by the interviewed households.

TABLE A-3

Partnerships and Participation to Survey (% of households)

	COCOA-GROWING AREAS				
	PPAP		Non-PPAP		DIFF
	Mean	N	Mean	N	p-value
Partnerships					
Heard of PPAP	46.6	414	29.1	327	0.000
Has a Lead Partner under the PPAP	59.1	193	46.3	95	0.041
Received tools from LP	48.2	114	38.6	44	0.274
Replaced tools	10.9	55	11.8	17	0.925
Received seedlings from LP	79.8	114	50.0	44	0.000
Used seedlings	91.2	91	90.9	22	0.966
Happy to participate in survey in 2019	**93.2**	**411**	**95.4**	**327**	**0.191**

	COFFEE-GROWING AREAS				
	PPAP		Non-PPAP		DIFF
	Mean	N	Mean	N	p-value
Partnerships					
Heard of PPAP	18.9	428	20.2	252	0.678
Has a Lead Partner under the PPAP	12.3	81	21.6	51	0.180
Received tools from LP	30.0	10	9.1	11	0.239
Replaced tools	0.0	3	0.0	1	-
Received seedlings from LP	10	10	0.0	11	0.317
Used seedlings	100	1	-	0	-
Happy to participate in survey in 2019	**89.9**	**425**	**89.6**	**249**	**0.894**

Sources: PPAP Cocoa & Coffee Surveys, 2017.

Non-response concerning key variables is relatively low. One example is income with a response rate of 96.2 percent in the Cocoa Survey compared to 89.0 percent in the Coffee Survey. Concerning the women's empowerment module, 550 out of 551 of eligible sampled women answered this part of the questionnaire in the Cocoa Survey, compared to 390 out of 392 in the Coffee Survey. Among them, 91.3 percent declared they currently have a partner in the Cocoa Survey, compared to 88.5 percent in the Coffee Survey; among 503 selected woman partners, 418 answered the questionnaire (response rate of selected woman partners is thus 83.1 percent) in the Cocoa Survey, compared to 244 among 347 selected woman partners in the Coffee Survey.

Time-use sheet has been answered by 2231 individuals out of 2264 eligible in the Cocoa Survey, (response rate is 98.5 percent) which is very high given the length of the questionnaire as a whole. The response rate is 86.7 percent in the Coffee Survey. As shown in Table A-4 below, a typical day represents 23.1 percent of total answers in the cocoa-growing areas and 21.7 percent in coffee-growing areas. It is difficult to determine precisely what constitutes a typical day.

Therefore, it is recommended to use all the answers in the time-use analysis (robustness checks could be provided by subtracting a typical day). Also, note that as few as 5.3 percent of individuals answered in reference to a Sunday in the Cocoa Survey which can be considered de facto as a typical day. 13.2 percent of individuals answered in reference to a Sunday in the Coffee Survey. Other indications concerning answers quality are questions concerning busyness and a comfortable amount of time during the day: in cocoa-growing areas, 7.2 percent consider they were not busy enough (compared to 30.0 percent in coffee-growing areas), and 8.1 percent had no comfortable amount of time (compared to 23.9 percent in coffee-growing areas). Although this is very subjective, these answers are indications of a typical day as well. Finally, 41.1 percent of respondents have a watch in cocoa-growing areas, compared to 23.3 percent in coffee-growing areas, which may be a better position to assess the time spent on various activities.

TABLE A-4

Time-Use Variables (% of individuals)—Cocoa Survey

	OVERALL	MEN	WOMEN	PPAP	NON-PPAP
Time sheet answered	98.5	98.8	98.6	98.8	98.2
Monday	16.9	16.9	16.9	17.6	16.0
Tuesday	16.4	17.2	15.4	18.5	13.6
Wednesday	16.0	16.0	16.0	18.4	13.0
Thursday	15.2	14.7	15.8	13.6	17.3
Friday	18.1	17.9	18.3	15.1	21.9
Saturday	12.1	11.7	12.4	12.2	11.9
Sunday	5.3	5.5	5.2	4.6	6.3
Atypical day	23.1	22.4	23.9	24.7	21.0
Was too busy	34.9	35.9	33.8	35.7	33.8
Not busy enough	7.2	7.1	7.2	7.9	6.2
Had a comfortable amount of time	49.8	50.0	49.7	48.7	51.3
No comfortable amount of time	8.1	7.0	9.3	7.7	8.6
Has a watch	41.1	50.5	31.0	39.3	43.4

Sources: PPAP Cocoa Survey, 2017.

TABLE A-5

Time-Use Variables (% of individuals)—Coffee Survey

	OVERALL	MEN	WOMEN	PPAP	NON-PPAP
Time sheet answered	86.7	90.4	84.3	86.2	88.6
Monday	12.7	12.5	13.0	14.8	5.5
Tuesday	12.7	13.2	12.1	14.0	8.2
Wednesday	20.0	19.8	20.3	19.0	23.8
Thursday	11.8	12.1	11.3	12.5	9.0
Friday	18.4	18.3	18.4	18.1	19.4
Saturday	11.2	11.4	10.9	10.9	12.0
Sunday	13.2	12.6	14.0	10.7	22.1
A typical day	21.7	23.1	19.9	21.7	21.6
Was too busy	36.8	36.7	36.8	37.3	34.8
Not busy enough	30.0	30.3	29.7	28.7	34.5
Had a comfortable amount of time	9.3	8.4	10.5	9.5	8.8
No comfortable amount of time	23.9	24.6	22.9	24.4	21.9
Has a watch	23.3	32.6	11.6	23.8	21.4

Source: PPAP Coffee Survey, 2017

APPENDIX B1

INDEX WEIGHTS (COCOA)

TABLE B1-1

Asset Wealth Index

	WEIGHT	MEAN	INERTIA %
Stove	5.8	0.066	0.047
Refrigerator	5.1	0.109	0.058
Microwave oven	11.6	0.004	0.023
Fan	8.1	0.030	0.047
Television	3.7	0.279	0.060
Cassette/CD player	3.8	0.084	0.027
VCR/DVD	4.3	0.146	0.052
Camera	6.1	0.063	0.049
Radio	0.9	0.598	0.008
Computer	5.9	0.076	0.054
Mobile Phone	1.6	0.737	0.015
Bicycle	1.0	0.231	0.008
Motorcycle	4.5	0.012	0.014
Car	5.4	0.043	0.026
Truck/bus	5.6	0.026	0.018
Boat/dinghy	4.7	0.007	0.006
Good quality walls	1.6	0.119	0.009
Good quality roof	1.8	0.838	0.018
Good quality floor	1.6	0.107	0.009

	WEIGHT	MEAN	INERTIA %
Cooking fuel (gas or electricity)	6.0	0.030	0.026
Electric lights	1.9	0.552	0.023
Piped water	-0.3	0.032	0.002
Flush toilet	6.0	0.034	0.035
Latrine	-0.1	0.780	0.015
Wheel barrow	2.2	0.393	0.028
Chainsaw	2.6	0.161	0.021
Knapsack - Good quality e.g. CP3	2.1	0.383	0.038
Knapsack - Low quality e.g. Chinese brand	0.1	0.070	0.009
Secateurs - Good quality	2.0	0.308	0.035
Secateurs - Low quality e.g. Chinese brand	0.5	0.053	0.015
Bow saw - Good quality	2.4	0.217	0.038
Bow saw - Low quality e.g. Chinese brand	-0.5	0.043	0.016
Spade	1.4	0.825	0.016
Bush knife	1.9	0.974	0.006
Cocoa bags	1.4	0.093	0.011
Canvas or drying sheets	2.5	0.078	0.017
Harvest containers/buckets	0.5	0.238	0.013
Hand pulper machine	1.6	0.008	0.003
Motor generated pulper machine	0.4	0.003	0.002
Other	2.6	0.013	0.004
Other cocoa processing equipment	2.6	0.004	0.004
Pole Pruner	1.8	0.016	0.004
One block	-0.2	0.637	0.038
Sells poultry	0.5	0.120	0.003
Sells pigs	-0.2	0.312	0.003
Bank account	2.1	0.603	0.026

TABLE B1-2

Permission Index

	WEIGHT	MEAN	INERTIA %
Ask permission to her/his partner to go to:			
The market	16.8	0.701	0.168
The health center	17.6	0.733	0.173
The community center, neighbourhood park	17.4	0.704	0.182
A place of worship	14.7	0.582	0.146
Visit relatives in the neighbourhood	16.3	0.683	0.167
Visit friends in the neighbourhood	15.7	0.653	0.162
Partner pays for phone	-1.5	0.028	0.000

TABLE B1-3

Agreement Index

	WEIGHT	MEAN	INERTIA %
Partners agree on:			
Religion	9.2	0.926	0.059
Politics	5.4	0.783	0.052
Family	10.5	0.924	0.079
Friends	6.2	0.760	0.084
Money	8.3	0.909	0.063
House work	6.0	0.707	0.091
Work	9.1	0.890	0.088
Moral rules	6.3	0.790	0.079
Relationship between parents and children	10.4	0.901	0.103
Education of children	11.1	0.931	0.086
Not consult her partner to buy clothes	5.6	0.830	0.053
Not consult her partner for children purchases	7.1	0.877	0.063
Not afraid to disagree with partner, angry with you	1.9	0.294	0.037
Not afraid to disagree with partner, angry with your children	1.6	0.144	0.035
Not found at risk with partner	1.4	0.193	0.032

TABLE B1-4

Family Problem Index

	WEIGHT	MEAN	INERTIA %
Problem in family in the last two years:			
Bad relationship between parents and children	16.7	0.061	0.132
Lack of money	-0.6	0.407	0.028
Alcoholism of a member	12.0	0.170	0.166
Illness of a member	3.6	0.334	0.034
Lack of work of a member	5.1	0.194	0.051
Absence of the father	4.1	0.158	0.029
Absence of the mother	-0.6	0.061	0.016
Lack of time	8.0	0.142	0.069
Addiction of a member	16.6	0.029	0.077
Domestic violence	18.3	0.089	0.229
Imprisonment of a member	14.0	0.012	0.030
Infidelity	11.7	0.013	0.026
Interference from other families in your relationship	10.8	0.119	0.111

TABLE B1-5

Decision Index

	WEIGHT	MEAN	INERTIA %
Woman decides:			
Buy durable household goods	3.8	0.950	0.059
How much to spend on food and toiletries	9.7	0.977	0.074
Arrange/decorate the house	9.7	0.947	0.054
Send the children to school	13.9	0.873	0.131
Take children to medical checks	18.1	0.896	0.217
Take the children to the doctor when sick	20.5	0.914	0.236
If you must work outside the home or not	8.4	0.787	0.080
Having how many children	7.9	0.800	0.054
Take the kids to play	7.9	0.498	0.094
Partner decides:			
Buy durable household goods	19.0	0.934	0.131
How much to spend on food and toiletries	12.2	0.853	0.114
Arrange/decorate the house	8.3	0.707	0.085
Send the children to school	12.2	0.803	0.136
Take children to medical checks	12.1	0.765	0.165
Take the children to the doctor when sick	13.3	0.795	0.182
If you must work outside the home or not	9.5	0.781	0.087
Having how many children	7.4	0.784	0.050
Take the kids to play	6.1	0.430	0.051

APPENDIX B2

INDEX WEIGHTS (COFFEE)

TABLE B2-1

Asset Wealth Index

	WEIGHT	MEAN	INERTIA %
Stove	9.6	0.025	0.027
Refrigerator	9.4	0.024	0.029
Microwave oven			
Fan	15.1	0.001	0.010
Television	6.6	0.126	0.052
Cassette/CD player	5.8	0.088	0.028
VCR/DVD	7.2	0.069	0.037
Camera	5.5	0.060	0.019
Radio	0.8	0.571	0.021
Computer	7.2	0.024	0.017
Mobile Phone	1.3	0.484	0.019
Bicycle	3.5	0.034	0.007
Motorcycle	5.6	0.009	0.016
Car	9.2	0.018	0.022
Truck/bus	4.5	0.007	0.018
Boat/dinghy	8.2	0.001	0.020
Good quality walls	2.6	0.022	0.006
Good quality roof	2.7	0.335	0.021
Good quality floor	5.9	0.057	0.025

	WEIGHT	MEAN	INERTIA %
Cooking fuel (gas or electricity)	8.9	0.034	0.034
Electric lights	4.1	0.219	0.033
Piped water	-0.1	0.085	0.005
Flush toilet	7.4	0.004	0.017
Latrine	-0.2	0.982	0.013
Wheel barrow	6.1	0.076	0.027
Chainsaw	7.3	0.010	0.008
Knapsack - Good quality e.g. CP3	3.6	0.185	0.026
Knapsack - Low quality e.g. Chinese brand	1.3	0.104	0.025
Secateurs - Good quality	5.1	0.119	0.034
Secateurs - Low quality e.g. Chinese brand	1.6	0.065	0.031
Bow saw - Good quality	3.0	0.193	0.021
Bow saw - Low quality e.g. Chinese brand	2.0	0.076	0.025
Spade	1.4	0.951	0.026
Bush knife	1.2	0.960	0.028
Cocoa bags	1.2	0.716	0.022
Canvas or drying sheets	0.7	0.591	0.026
Harvest containers/buckets	2.4	0.428	0.026
Hand pulper machine	1.5	0.350	0.022
Motor generated pulper machine	3.5	0.012	0.005
Other	0.1	0.004	0.002
Other cocoa processing equipment	5.2	0.001	0.006
One block	1.8	0.710	0.096
Sells poultry	2.2	0.126	0.009
Sells pigs	0.7	0.479	0.006
Bank account	3.9	0.246	0.029

TABLE B2-2

Permission Index

	WEIGHT	MEAN	INERTIA %
Ask permission to her/his partner to go to:			
The market	17.0	0.435	0.179
The health center	17.2	0.491	0.189
The community center, neighbourhood park	17.3	0.415	0.183
A place of worship	16.2	0.394	0.155
Visit relatives in the neighbourhood	15.4	0.438	0.149
Visit friends in the neighbourhood	15.2	0.437	0.146
Partner pays for phone	1.8	0.006	0.001

TABLE B2-3

Agreement Index

	WEIGHT	MEAN	INERTIA %
Partners agree on:			
Religion	11.0	0.896	0.090
Politics	2.8	0.674	0.019
Family	11.8	0.904	0.096
Friends	6.0	0.699	0.065
Money	7.4	0.894	0.040
House work	6.2	0.733	0.066
Work	8.9	0.822	0.090
Moral rules	9.2	0.803	0.106
Relationship between parents and children	10.0	0.838	0.109
Education of children	9.4	0.915	0.053
Not consult her partner to buy clothes	4.0	0.591	0.051
Not consult her partner for children purchases	4.4	0.694	0.053
Not afraid to disagree with partner, angry with you	3.3	0.470	0.062
Not afraid to disagree with partner, angry with your children	2.2	0.304	0.042
Not found at risk with partner	3.4	0.442	0.059

TABLE B2-4

Family Problem Index

	WEIGHT	MEAN	INERTIA %
Problem in family in the last two years:			
Bad relationship between parents and children	11.8	0.259	0.154
Lack of money	3.1	0.770	0.068
Alcoholism of a member	12.2	0.132	0.093
Illness of a member	5.5	0.338	0.045
Lack of work of a member	8.7	0.181	0.105
Absence of the father	9.4	0.139	0.060
Absence of the mother	18.4	0.033	0.059
Lack of time	1.5	0.194	0.064
Addiction of a member	9.9	0.052	0.045
Domestic violence	10.1	0.397	0.151
Imprisonment of a member	15.6	0.011	0.038
Infidelity	-2.5	0.016	0.020
Interference from other families in your relationship	9.4	0.208	0.096

TABLE B2-5

Decision Index

	WEIGHT	MEAN	INERTIA %
Woman decides:			
Buy durable household goods	10.1	0.868	0.093
How much to spend on food and toiletries	13.0	0.897	0.124
Arrange/decorate the house	11.9	0.871	0.119
Send the children to school	16.0	0.916	0.155
Take children to medical checks	12.3	0.825	0.170
Take the children to the doctor when sick	15.2	0.942	0.098
If you must work outside the home or not	6.1	0.571	0.074
Having how many children	9.9	0.817	0.107
Take the kids to play	5.6	0.325	0.061
Partner decides:			
Buy durable household goods	13.0	0.850	0.102
How much to spend on food and toiletries	9.9	0.729	0.107
Arrange/decorate the house	8.5	0.557	0.099
Send the children to school	16.1	0.850	0.147
Take children to medical checks	12.9	0.647	0.189
Take the children to the doctor when sick	13.2	0.727	0.172
If you must work outside the home or not	7.0	0.532	0.068
Having how many children	11.8	0.880	0.064
Take the kids to play	7.6	0.238	0.052

APPENDIX C

COMPLEMENTARY TABLES (COCOA)

TABLE C-1

Literacy and School Attendance

	FEMALE		MALE		DIFF
	Mean	N	Mean	N	p-value
Literacy (10 years old or more)*					
Total	90.1	1257	90.4	1321	0.778
10 to 24 years	91.7	460	87.4	492	0.028
25 to 39 years	93.7	350	92.9	297	0.691
40 to 59 years	85.5	372	91.8	404	0.005
60 or more	85.3	75	91.4	128	0.206
School attendance (6 to 24 years)					
Total	72.6	555	68.8	597	0.160
6 to 13 years	81.3	209	81.4	226	0.984
14 to 18 years	88.8	205	86.5	192	0.484
19 to 24 years	36.2	141	34.1	179	0.698

Sources: PPAP Survey, 2017. *Reads and write English or Pidgin.

TABLE C-2

School Level and Completion

	FEMALE		MALE		DIFF
	Mean	N	Mean	N	p-value
School level (6 to 24 years)					
None/Kindergarten	5.3	1328	5.5	1400	0.859
Primary	46.9	1328	41.4	1400	0.004
Secondary	40.2	1328	38.4	1400	0.322
University/tertiary	3.9	1328	12.2	1400	0.000
Other	3.6	1328	2.5	1400	0.092
Years completed (among those who stopped studying)	7.4	901	7.9	969	0.000

Sources: PPAP Survey, 2017.

TABLE C-3

Participation, Employment and Unemployment

	FEMALE		MALE		DIFF
	Mean	N	Mean	N	p-value
All (10-69 years old)					
Participation rate	74.5	1245	78.6	1292	0.017
Employment rate	93.8	928	93.2	1015	0.625
Unemployment rate	0.4	928	0.8	1015	0.309
Adult (25-69 years old)					
Participation rate	94.8	785	96.5	800	0.093
Employment rate	95.4	744	95.6	772	0.876
Unemployment rate	0.3	744	0.6	772	0.273

Sources: PPAP Survey, 2017.

TABLE C-4

Employment Characteristics

	FEMALE		MALE		DIFF
	Mean	N	Mean	N	p-value
Schedule					
Full time (35+ hours)	32.5	870	37.9	946	0.016
Part time	67.5	870	62.1	946	0.016
Occupation					
Farmer	76.6	870	72.6	946	0.054
Fisherman	0.2	870	0.8	946	0.070
Hunter	0.0	870	0.0	946	-
Forestry worker	0.0	870	0.2	946	0.157
Services & sales worker	4.3	870	3.9	946	0.714
Clerical worker	1.6	870	0.5	946	0.027
Technician	0.5	870	4.1	946	0.000
Professional	5.7	870	6.2	946	0.660
Manager	0.2	870	0.8	946	0.070
Student	7.1	870	8.4	946	0.329
Other	3.8	870	2.3	946	0.071

	FEMALE		MALE		DIFF
	Mean	N	Mean	N	p-value
Employment status					
Employee (Wage), public sector	4.5	870	4.2	946	0.791
Employee (Wage), private, Cocoa	1.0	870	3.1	946	0.002
Employee (Wage), private, other agricultural	2.9	870	4.4	946	0.074
Employee (Wage), private, non-agricultural	4.4	870	6.6	946	0.040
Self-employed, Cocoa	32.0	870	47.3	946	0.000
Self-employed, other agricultural	37.8	870	15.9	946	0.000
Self-employed, non-agricultural	3.9	870	5.6	946	0.089
Unpaid family worker	8.6	870	6.4	946	0.080
Apprentice	0.0	870	0.4	946	0.045
NGO	0.2	870	0.3	946	0.721
Coop	0.0	870	0.2	946	0.157
Student	3.9	870	5.0	946	0.272
Other	0.8	870	0.6	946	0.669

Sources: PPAP Survey, 2017.

TABLE C-5

Reasons for not Working

	FEMALE		MALE		DIFF
	Mean	N	Mean	N	p-value
Reasons for not working:					
Domestic work	0.9	322	0.4	285	0.365
Personal / family affairs	0.3	322	0.7	285	0.503
Pregnancy / delivery	0.9	322	0.0	285	0.082
Caring for children	5.6	322	2.5	285	0.047
Illness	3.7	322	3.9	285	0.932
Disability	4.3	322	6.7	285	0.214
Too young	0.0	322	0.4	285	0.317
Remittances	4.7	322	3.5	285	0.474
Old aged/ pension	78.9	322	80.0	285	0.734
Student	0.6	322	2.1	285	0.121
Other	0.0	322	0.0	285	-

Sources: PPAP Survey, 2017.

TABLE C-6

Household Composition, Income and Satisfaction

	TOTAL		FEMALE HEAD		MALE HEAD		GENDER GAP
	Mean	N	Mean	N	Mean	N	p-value
Main source of income							
Earning from cocoa	47.3	710	39.1	46	47.9	664	0.245
Earning from other agriculture products	33.8	710	45.7	46	33.0	664	0.098
Earning from livestock	0.0	710	0.0	46	0.0	664	-
Earning from fishing	0.8	710	0.0	46	0.9	664	0.014
Earning from non-agriculture business	5.5	710	6.5	46	5.4	664	0.771
Salaries/wages/commissions	11.0	710	4.3	46	11.4	664	0.031
Earning from rents (house/assets/properties)	0.6	710	0.0	46	0.6	664	0.045
Remittances from abroad	0.0	710	0.0	46	0.0	664	-
Domestic remittances	0.8	710	4.3	46	0.6	664	0.220
Pension	0.0	710	0.0	46	0.0	664	-
Aid in nature / cash	0.0	710	0.0	46	0.0	664	-
Freely from forest	0.0	710	0.0	46	0.0	664	-
Other	0.1	710	0.0	46	0.2	664	0.317
Wealth scale (from 1 the poorest to 10 the richest)							
Today	4.4	728	4.0	46	4.4	682	0.158
Five years ago	3.7	728	3.7	46	3.7	682	0.979
In five years	6.6	727	5.8	46	6.6	681	0.015

	TOTAL		FEMALE HEAD		MALE HEAD		GENDER GAP
	Mean	N	Mean	N	Mean	N	p-value
Income by source							
Cocoa - wet bean	245.5	731	166.4	49	251.1	682	0.248
Cocoa - dry bean	1809.9	731	438.5	49	1908.4	682	0.000
Coconuts	1453.8	731	541.7	49	1519.4	682	0.000
Off-farm employment	4272.5	731	237.8	49	4562.4	682	0.000
Non-farm income e.g. trade store. PMV	2659.4	731	526.5	49	2812.7	682	0.000
Hunting and fishing	131.0	731	26.5	49	138.5	682	0.025
Gifts. Customary payments. remittances	75.7	731	105.1	49	73.6	682	0.582
Balsa	6.2	731	0.0	49	6.6	682	0.264
Other agricultural	245.4	731	303.2	49	241.2	682	0.718
Other	30.9	731	0.0	49	33.1	682	0.114
Total income per capita	**3170.7**	**725**	**945.7**	**45**	**3317.9**	**680**	**0.000**
Household composition							
Number of members 12 years and less	0.8	731	0.7	49	0.8	682	0.526
Number of members 13-17 years	0.5	731	0.3	49	0.5	682	0.019
Number of members 18-59 years	2.5	731	1.9	49	2.5	682	0.004
Number of members 60 years and more	0.3	731	0.3	49	0.3	682	0.878

Sources: PPAP Survey, 2017.

TABLE C-7

Who Makes Purchasing Decision, Including Durable Goods?

	WOMAN ALONE		BOTH WOMAN & MAN	
	Estimate	P-value	Estimate	P-value
Hours of domestic work	0.001	0.506	-0.001	0.651
Hours of formal work	-0.003	0.622	0.005	0.373
Share of alternative crop income in total income	-0.001	0.554	0.001	0.540
Hours wage by outsider (female)	0.000	0.954	0.000	0.796
Hours wage by outsider (male)	0.001	0.444	-0.001	0.599
Asset wealth index	-0.002	0.017	0.002	0.009
Living in ARB	0.010	0.650	-0.029	0.201
Married or common law	-0.545	0.000	0.619	0.000
Number of members 12 years and less	-0.005	0.539	0.007	0.379
Number of members 13-17 years	-0.034	0.012	0.025	0.065
Number of members 18-59 years	-0.028	0.005	0.023	0.023
Number of members 60 years and more	-0.085	0.000	0.074	0.001
Participation to agriculture association or group	-0.011	0.640	-0.004	0.850
Participation to non-agric association or group	-0.016	0.441	0.012	0.576
Participation to PPAP	0.012	0.555	-0.010	0.628
Age	0.004	0.000	-0.003	0.004
Years of schooling	0.004	0.330	-0.005	0.202
Training on cocoa	0.038	0.322	-0.015	0.695
Information on cocoa	-0.014	0.619	-0.011	0.689
Has a phone	0.050	0.033	-0.055	0.021
Has access to internet	0.137	0.005	-0.117	0.018
Intercept	0.498	0.000	0.413	0.000
N	525		525	
R-square	0.3668		0.4024	

Sources: PPAP Survey, 2017.

TABLE C-8

Trends in Activities (frequencies) Performed by Household Members

	2011			2016			
%	Female	Male	Diff p-value	Female	Male	Diff p-value	Diff-in-diff p-value
Clearing Land	11.4	15.5	0.017	20.1	26.0	0.001	0.491
Lining	5.6	9.2	0.007	10.3	20.6	0.000	0.001
Shade establishment	5.2	8.1	0.021	6.7	14.2	0.000	0.011
Nursery operations	2.3	4.3	0.028	4.6	8.6	0.000	0.150
Holing and planting	5.8	8.5	0.037	14.3	20.4	0.000	0.108
Weeding (establishment phase)	4.9	7.9	0.017	14.9	18.5	0.019	0.734
Fertilizing/mulching (establishment phase)	0.0	0.4	0.083	0.5	1.2	0.050	0.393
Pest and disease management (establishment phase)	1.2	3.6	0.002	1.8	5.1	0.000	0.416
Weeding (production phase)	21.2	28.8	0.001	29.2	36.0	0.000	0.792
Pruning	7.3	20.8	0.000	6.7	32.8	0.000	0.000
Fertilizing/mulching (production phase)	0.1	0.7	0.074	0.8	1.1	0.483	0.562
Spraying agro-chemicals	2.3	6.9	0.000	1.8	13.2	0.000	0.000
Pest and disease management (production phase)	2.7	6.8	0.000	3.3	11.0	0.000	0.014
Soil and water conservation	0.3	0.7	0.215	0.2	1.4	0.001	0.152
Harvesting (including burying husks for CPB control)	17.9	19.7	0.365	26.8	28.5	0.366	0.962
Fermentary operations	6.6	10.8	0.003	11.6	20.3	0.000	0.033
Selling cocoa	16.2	24.3	0.000	19.3	28.3	0.000	0.749

Sources: PPAP Survey, 2012-2017.

TABLE C-9

Trends in Activities (days of work) Performed by Household Members

	2011			2016			
	Female	Male	Diff p-value	Female	Male	Diff p-value	Diff-in-diff p-value
Clearing Land	4.9	4.8	0.849	10.0	11.1	0.569	0.549
Lining	3.3	3.6	0.403	7.4	4.9	0.281	0.226
Shade establishment	3.3	3.6	0.633	7.3	5.5	0.444	0.391
Nursery operations	4.6	4.3	0.666	24.3	26.9	0.750	0.719
Holing and planting	3.7	4.3	0.343	4.2	5.5	0.037	0.383
Weeding (establishment phase)	3.1	4.1	0.176	10.9	12.6	0.544	0.800
Fertilizing/mulching (establishment phase)	0.0	2.0	-	2.6	3.9	0.334	-
Pest and disease management (establishment phase)	2.0	2.5	0.190	21.8	11.6	0.489	0.468
Weeding (production phase)	4.9	5.1	0.799	17.7	16.1	0.480	0.455
Pruning	3.8	4.6	0.062	9.2	8.7	0.723	0.379
Fertilizing/mulching (production phase)	2.0	2.0	1.000	8.2	6.2	0.405	0.424
Spraying agro-chemicals	3.1	3.3	0.757	22.3	15.1	0.631	0.622
Pest and disease management (production phase)	2.5	3.3	0.105	9.6	16.0	0.021	0.046
Soil and water conservation	1.5	1.0	0.317	4.0	9.6	0.011	0.007
Harvesting (including burying husks for CPB control)	2.4	2.8	0.313	13.3	13.1	0.897	0.751
Fermentary operations	4.4	6.4	0.112	19.9	22.6	0.363	0.847
Selling cocoa	1.2	1.7	0.042	7.3	6.1	0.070	0.021

Sources: PPAP Survey, 2012-2017.

TABLE C-10

Trends in Activities Performed by Household Members (Frequencies x Days of Work)

	2011			2016			
%	Female	Male	Diff p-value	Female	Male	Diff p-value	Diff-in-diff p-value
Clearing Land	0.6	0.9	0.084	2.0	2.9	0.077	0.220
Lining	0.2	0.4	0.001	0.8	1.0	0.392	0.857
Shade establishment	0.2	0.3	0.022	0.5	0.8	0.171	0.501
Nursery operations	0.1	0.2	0.216	1.1	2.3	0.047	0.060
Holing and planting	0.2	0.4	0.018	0.6	1.1	0.000	0.023
Weeding (establishment phase)	0.1	0.3	0.014	1.6	2.3	0.160	0.282
Fertilizing/mulching (establishment phase)	0.0	0.0	0.317	0.0	0.0	0.047	0.067
Pest and disease management (establishment phase)	0.0	0.1	0.003	0.4	0.6	0.513	0.660
Weeding (production phase)	1.2	1.6	0.018	5.2	5.8	0.426	0.846
Pruning	0.3	1.0	0.000	0.6	2.9	0.000	0.000
Fertilizing/mulching (production phase)	0.0	0.0	0.279	0.1	0.1	0.965	0.884
Spraying agro-chemicals	0.1	0.2	0.002	0.4	2.0	0.000	0.001
Pest and disease management (production phase)	0.1	0.2	0.000	0.3	1.8	0.000	0.000
Soil and water conservation	0.0	0.0	0.664	0.0	0.1	0.003	0.004
Harvesting (including burying husks for CPB control)	0.5	0.6	0.137	3.6	3.7	0.767	0.956
Fermentary operations	0.3	0.8	0.006	2.3	4.6	0.000	0.002
Selling cocoa	0.2	0.4	0.000	1.4	1.7	0.134	0.668

Sources: PPAP Survey, 2012-2017.

TABLE C-11

Trends in Activities Performed by Outsiders

	2011			2016			
	Female	Male	Diff p-value	Female	Male	Diff p-value	Diff-in-diff p-value
Hours of paid labour by outsiders	39.1	58.2	0.420	4.3	39.4	0.000	0.534
Average hourly wage for outsiders (PGK)	7.1	14.0	0.437	21.3	17.5	0.456	0.295

Sources: PPAP Survey, 2012-2017.

TABLE C-12

Activity-Based Decision Making

	2011			2016			
%	Female	Male	Diff p-value	Female	Male	Diff p-value	Diff-in-diff p-value
Primarily involved in selling livestock	-	-	-	6.2	12.1	0.000	-
Primarily involved in selling cocoa	8.6	26.2	0.000	8.9	20.5	0.000	0.003
Primarily involved in receiving payments for cocoa	12.4	22.7	0.000	9.3	20.1	0.000	0.807
Involved in planning and decision making about cocoa production	22.8	7.6	0.000	26.4	38.2	0.000	0.000
Operate the account	9.1	14.8	0.000	15.1	25.3	0.000	0.024

Sources: PPAP Survey, 2012-2017.

TABLE C-13

OLS Regressions on Time-Use (Women)

	TOTAL HOURS OF WORK		PRIMARY PRODUCTION		FORMAL WORK		NON-PRIMARY PRODUCTION		DOMESTIC WORK		LEARNING		PERSONAL CARE	
	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value
Age	0.027	0.100	0.010	0.487	0.008	0.341	0.008	0.160	-0.151	0.000	-0.009	0.000	-0.007	0.640
Years of schooling	0.181	0.014	-0.025	0.711	0.235	0.000	-0.029	0.260	-0.311	0.045	-0.004	0.650	0.073	0.301
Literacy in English	0.889	0.089	0.800	0.097	-0.187	0.501	0.276	0.133	2.606	0.019	0.029	0.671	-0.565	0.262
Literacy in Pidgin	-1.880	0.006	-1.179	0.061	-0.589	0.104	-0.112	0.639	-0.372	0.796	-0.044	0.625	0.219	0.738
Training on cocoa	-0.543	0.346	0.006	0.990	-0.467	0.128	-0.082	0.685	0.517	0.671	0.004	0.963	0.035	0.949
Information on cocoa	0.590	0.164	0.275	0.482	0.179	0.430	0.136	0.362	-1.060	0.238	-0.020	0.725	-0.418	0.308
Has a phone	0.478	0.181	-0.248	0.452	0.370	0.052	0.355	0.005	-0.537	0.478	0.029	0.538	-0.370	0.283
Has access to internet	-1.729	0.022	-0.694	0.319	-0.408	0.311	-0.627	0.019	-0.176	0.912	-0.111	0.267	2.317	0.002
Female head	-1.248	0.134	-1.264	0.100	0.249	0.574	-0.233	0.427	2.736	0.121	-0.235	0.033	-0.088	0.913
Married or common law	0.000	1.000	0.254	0.714	-0.045	0.909	-0.208	0.431	2.464	0.121	-0.498	0.000	-0.134	0.853
Number of members 12 years and less	-0.142	0.266	-0.027	0.820	-0.069	0.310	-0.046	0.304	1.222	0.000	0.004	0.814	-0.250	0.043
Number of members 13-17 years	0.204	0.324	0.057	0.763	0.077	0.483	0.069	0.342	0.582	0.183	0.052	0.057	-0.426	0.033
Number of members 18-59 years	-0.151	0.316	-0.030	0.831	-0.065	0.416	-0.056	0.290	0.235	0.460	-0.015	0.438	0.228	0.117
Number of members 60 years and more	0.067	0.844	0.071	0.822	0.013	0.945	-0.017	0.891	0.322	0.657	0.178	0.000	-0.011	0.974
Hours wage by outsider (female)	0.025	0.232	0.025	0.195	0.002	0.834	-0.002	0.749	0.069	0.126	0.000	0.933	0.014	0.483
Hours wage by outsider (male)	-0.019	0.249	-0.011	0.462	-0.005	0.558	-0.003	0.647	-0.053	0.136	-0.001	0.593	-0.042	0.010
Participation to agriculture association or group	0.375	0.282	0.318	0.324	0.088	0.635	-0.031	0.803	0.013	0.986	-0.002	0.961	-0.028	0.933

Asset wealth index	-0.008	0.575	-0.023	0.073	0.006	0.396	0.009	0.067	0.019	0.526	0.000	0.815	0.001	0.914
Living in ARB	0.448	0.233	0.003	0.993	0.311	0.121	0.134	0.311	-0.051	0.948	-0.023	0.647	0.567	0.118
Permission index	-0.007	0.228	-0.004	0.500	-0.004	0.237	0.000	0.888	0.002	0.882	0.000	0.670	0.013	0.017
Agreement index	0.009	0.363	0.001	0.882	0.006	0.242	0.002	0.669	-0.013	0.562	0.002	0.114	0.011	0.294
Family problem index	-0.009	0.380	-0.007	0.450	-0.003	0.603	0.001	0.784	0.010	0.647	0.002	0.236	-0.002	0.834
Decision index (woman decide)	0.006	0.591	0.004	0.657	-0.003	0.659	0.004	0.305	-0.045	0.046	-0.001	0.378	0.007	0.477
Decision index (partner decide)	-0.002	0.831	-0.007	0.383	0.006	0.186	-0.001	0.749	0.017	0.361	0.002	0.036	0.001	0.938
Female Involved in planning and decision making about cocoa production (household level variable)	0.273	0.450	0.208	0.532	-0.114	0.554	0.178	0.161	-0.608	0.426	0.062	0.196	0.152	0.663
Male Involved in planning and decision making about cocoa production (household level variable)	-0.285	0.501	-0.150	0.700	0.011	0.960	-0.146	0.329	1.206	0.179	-0.076	0.177	0.045	0.912
Female Primarily involved in selling cocoa (household level variable)	-0.688	0.379	-0.290	0.688	-0.514	0.218	0.117	0.673	0.364	0.826	0.044	0.674	0.736	0.330
Female Primarily involved in receiving payments for cocoa (household level variable)	0.732	0.347	0.665	0.355	0.420	0.312	-0.353	0.198	-0.123	0.941	0.017	0.869	-0.198	0.792
Female manage account (household level variable)	0.677	0.063	0.194	0.564	0.467	0.016	0.017	0.897	-0.804	0.297	-0.029	0.543	-0.124	0.723
Afraid to disagree	0.022	0.952	0.065	0.845	0.017	0.930	-0.060	0.638	0.307	0.688	0.023	0.632	-0.374	0.282
Found at risk	-0.001	0.732	0.000	0.925	-0.001	0.633	0.000	0.998	-0.002	0.817	0.000	0.408	-0.001	0.831
Intercept	1.157	0.405	2.798	0.029	-1.398	0.059	-0.243	0.619	12.433	0.000	0.643	0.001	10.217	0.000
N	540		540		540		540		540		540		540	
R-square	0.0913		0.0565		0.1674		0.0679		0.1637		0.1608		0.1058	

Sources: PPAP Survey, 2017.

TABLE C-14

OLS Regressions on Time-Use (Men)

	TOTAL HOURS OF WORK		PRIMARY PRODUCTION		FORMAL WORK		NON-PRIMARY PRODUCTION		DOMESTIC WORK		LEARNING		PERSONAL CARE	
	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value
Age	-0.075	0.004	-0.029	0.197	-0.048	0.010	0.001	0.894	-0.008	0.729	-0.003	0.645	0.019	0.383
Years of schooling	-0.062	0.485	-0.141	0.067	0.000	0.996	0.080	0.030	0.076	0.360	0.012	0.566	-0.144	0.055
Literacy in English	-0.121	0.877	0.184	0.789	-0.049	0.931	-0.256	0.433	0.525	0.478	0.027	0.880	0.440	0.510
Literacy in Pidgin	-1.682	0.116	-1.717	0.065	-0.041	0.957	0.076	0.863	0.662	0.510	0.040	0.872	-0.269	0.767
Training on cocoa	0.431	0.393	0.487	0.269	-0.066	0.856	0.010	0.960	-0.092	0.847	-0.020	0.866	-0.001	0.999
Information on cocoa	0.425	0.425	0.479	0.302	-0.053	0.891	-0.002	0.993	-0.143	0.775	-0.235	0.057	-0.037	0.935
Has a phone	0.076	0.875	-0.619	0.142	0.684	0.049	0.011	0.956	-0.550	0.227	-0.102	0.363	-0.065	0.875
Has access to internet	-0.549	0.565	0.156	0.851	-0.099	0.885	-0.606	0.126	-0.493	0.584	0.834	0.000	0.568	0.483
Female head	-3.370	0.479	-0.520	0.900	-5.289	0.122	2.438	0.217	-0.954	0.831	-0.315	0.775	5.494	0.174
Married or common law	2.049	0.170	1.664	0.200	0.911	0.395	-0.526	0.394	-2.854	0.043	-0.826	0.017	-0.328	0.795
Number of members 12 years and less	-0.113	0.538	-0.151	0.343	-0.176	0.182	0.215	0.005	0.428	0.014	-0.026	0.547	-0.178	0.253
Number of members 13-17 years	-0.330	0.248	-0.386	0.121	-0.019	0.926	0.074	0.529	-0.395	0.143	0.009	0.887	-0.001	0.995
Number of members 18-59 years	0.592	0.011	0.412	0.041	0.161	0.334	0.019	0.844	0.130	0.550	0.020	0.715	0.028	0.887
Number of members 60 years and more	0.480	0.386	0.107	0.824	0.334	0.401	0.039	0.866	-0.210	0.686	-0.056	0.662	0.295	0.530
Hours wage by outsider (female)	0.175	0.731	-0.124	0.780	0.270	0.459	0.029	0.892	-0.096	0.841	0.041	0.725	-0.285	0.508
Hours wage by outsider (male)	-0.224	0.709	0.324	0.535	-0.750	0.082	0.202	0.416	-0.441	0.435	0.081	0.557	-0.918	0.072
Participation to agriculture association or group	0.192	0.667	0.013	0.974	0.081	0.800	0.098	0.597	-0.517	0.220	0.249	0.016	-0.353	0.351
Participation to non-agric association or group	0.018	0.386	-0.028	0.119	0.015	0.296	0.030	0.000	-0.015	0.434	0.000	0.922	0.000	0.983

Participation to PPAP	-0.201	0.697	0.548	0.223	-0.718	0.053	-0.031	0.883	-0.566	0.245	-0.058	0.627	1.378	0.002
Asset wealth index	-0.003	0.637	-0.002	0.718	-0.002	0.693	0.001	0.760	-0.008	0.223	0.000	0.876	0.008	0.167
Living in ARB	0.021	0.253	0.006	0.724	0.010	0.481	0.006	0.425	0.009	0.618	0.006	0.171	0.018	0.260
Permission index	0.017	0.390	-0.020	0.248	0.009	0.503	0.027	0.001	-0.031	0.092	-0.005	0.317	0.001	0.959
Agreement index	0.007	0.676	-0.018	0.254	0.032	0.014	-0.006	0.393	-0.012	0.461	-0.003	0.482	0.007	0.649
Family problem index	-0.006	0.714	0.019	0.213	-0.039	0.002	0.014	0.055	0.000	1.000	0.001	0.734	0.014	0.340
Decision index (woman decide)	-0.125	0.821	0.398	0.406	-0.207	0.601	-0.316	0.166	-0.445	0.391	0.058	0.648	0.098	0.833
Decision index (partner decide)	0.880	0.190	1.153	0.049	-0.652	0.177	0.378	0.174	0.726	0.251	-0.095	0.540	-0.588	0.302
Female Involved in planning and decision making about cocoa production (household level variable)	0.735	0.496	-0.165	0.861	1.065	0.170	-0.165	0.712	-0.567	0.577	-0.112	0.653	1.156	0.207
Male Involved in planning and decision making about cocoa production	-0.503	0.643	-0.484	0.609	-0.452	0.562	0.433	0.336	0.030	0.977	-0.023	0.927	-1.286	0.163
Female Primarily involved in selling cocoa (household level variable)	-0.582	0.257	-0.405	0.366	-0.217	0.556	0.040	0.851	-0.489	0.313	0.144	0.226	-0.167	0.701
Female Primarily involved in receiving payments for cocoa (household level variable)	-0.472	0.425	0.091	0.860	-0.296	0.485	-0.266	0.277	0.674	0.226	0.213	0.119	-0.601	0.231
Female manage account (household level variable)	-0.015	0.083	-0.008	0.274	-0.003	0.586	-0.003	0.343	-0.009	0.259	0.000	0.959	0.006	0.379
Afraid to disagree	4.529	0.093	3.967	0.092	2.684	0.166	-2.122	0.058	5.487	0.031	0.469	0.452	11.108	0.000
Found at risk														
Intercept	419		419		419		419		419		419		419	
	0.0978		0.161		0.1198		0.1394		0.1077		0.116		0.0898	
N	-0.075	0.004	-0.029	0.197	-0.048	0.010	0.001	0.894	-0.008	0.729	-0.003	0.645	0.019	0.383
R-square	-0.062	0.485	-0.141	0.067	0.000	0.996	0.080	0.030	0.076	0.360	0.012	0.566	-0.144	0.055

Sources: PPAP Survey, 2017.

TABLE C-15

Household Cocoa Production Regressions

	YIELD OF COCOA		INCOME PER TREE		NUMBER OF TREES		QUALITY OF PRUNING	
	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value
Inc. share alt. crop	0.142	0.912	-0.034	0.246	-3.367	0.434	0.065	0.703
Hrs. domestic work	-2.735	0.427	-0.040	0.604	0.653	0.955	-0.025	0.961
Female * Hrs dom work	3.874	0.273	0.031	0.692	1.021	0.931	0.020	0.970
Hrs. formal work	4.774	0.384	-0.056	0.648	-30.178	0.099	1.591	0.048
Female * Hrs formal work	3.142	0.726	-0.332	0.099	11.924	0.690	-0.729	0.591
Asset wealth index	-1.627	0.063	0.048	0.015	10.196	0.000	0.573	0.000
Living in ARB	11.530	0.644	2.484	0.000	292.402	0.000	-14.206	0.000
Female head	129.680	0.096	0.980	0.576	45.946	0.858	-1.355	0.910
Married or common law	-61.215	0.274	-0.596	0.636	-26.988	0.885	10.375	0.194
HHSize 12-	3.461	0.700	0.040	0.845	-49.277	0.096	-0.370	0.776
HHSize 13-17	20.037	0.149	0.712	0.023	-63.683	0.167	4.324	0.028
HHSize 18-59	9.012	0.388	0.594	0.011	19.310	0.574	-3.739	0.010
HHSize 60+	-29.051	0.196	0.797	0.115	-101.153	0.171	0.340	0.917
Particip. agric group	-30.589	0.180	-0.625	0.223	198.259	0.009	6.608	0.042
Particip. non-agric group	5.475	0.823	-0.632	0.252	17.924	0.826	-0.350	0.921
Participation to PPAP	17.763	0.415	0.195	0.691	232.233	0.001	7.658	0.015

Permission index	0.562	0.096	0.003	0.662	-0.970	0.387	0.000	0.996
Agreement index	-1.124	0.153	0.003	0.882	1.072	0.683	-0.056	0.615
Family problem index	1.917	0.015	0.034	0.053	-2.386	0.363	0.229	0.047
Woman decide index	-0.984	0.188	0.001	0.953	1.769	0.476	0.068	0.528
Man decide index	-0.090	0.888	0.028	0.051	-5.137	0.016	-0.092	0.315
Female planning	17.144	0.482	2.399	0.000	-230.970	0.004	-0.189	0.958
Male planning	160.583	0.001	1.369	0.217	421.794	0.008	1.626	0.867
Female selling	10.622	0.816	-1.210	0.238	156.500	0.304	-3.383	0.580
Female receiving	-0.889	0.985	-1.440	0.165	-20.218	0.896	-5.203	0.403
Female account	71.983	0.004	1.557	0.006	41.201	0.626	-1.766	0.626
Afraid to disagree	2.474	0.926	0.175	0.770	-108.502	0.217	1.880	0.606
Found at risk	-0.104	0.742	-0.009	0.199	0.925	0.371	-0.017	0.693
Intercept	128.293	0.496	-4.260	0.121	234.754	0.832	8.337	0.751
N	677		677		686		583	
R-square	0.073		0.157		0.106		0.144	

Sources: PPAP Survey, 2017.

TABLE C-16

Household Welfare Regressions – Cocoa-Growing Areas

	INCOME PER CAPITA (LOG)		WEALTH SCALE TODAY		WEALTH SCALE 5 YEARS AGO		WEALTH SCALE IN 5 YEARS	
	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value
Inc. share alt. crop	-0.045	0.000	-0.002	0.826	0.004	0.600	-0.005	0.537
Hrs. domestic work	0.007	0.592	0.056	0.001	0.016	0.343	0.042	0.020
Female * Hrs dom work	-0.006	0.639	-0.038	0.029	-0.023	0.185	-0.037	0.047
Hrs. formal work	0.043	0.019	0.029	0.198	-0.040	0.081	0.022	0.357
Female * Hrs formal work	-0.011	0.721	0.030	0.448	-0.007	0.857	0.008	0.844
Asset wealth index	0.037	0.000	0.060	0.000	0.042	0.000	0.057	0.000
Living in ARB	0.384	0.000	0.433	0.000	-0.125	0.284	0.515	0.000
Female head	-1.124	0.000	0.451	0.171	0.440	0.191	0.259	0.487
Married or common law	0.029	0.888	-0.375	0.161	0.065	0.808	-0.077	0.791
HHSize 12-	-0.248	0.000	-0.044	0.281	0.047	0.244	-0.040	0.367
HHSize 13-17	-0.236	0.000	0.050	0.420	0.011	0.862	-0.020	0.773
HHSize 18-59	-0.091	0.019	0.084	0.075	-0.058	0.224	0.079	0.129
HHSize 60+	-0.178	0.022	0.204	0.036	0.394	0.000	0.110	0.295
Particip. agric group	0.080	0.371	0.119	0.278	-0.196	0.077	0.077	0.517
Particip. non-agric group	-0.078	0.388	0.006	0.959	-0.073	0.516	0.069	0.565

Participation to PPAP	-0.138	0.083	0.115	0.235	0.025	0.797	0.227	0.036
Permission index	-0.003	0.033	0.000	0.955	0.004	0.011	-0.001	0.407
Agreement index	0.001	0.669	0.001	0.776	0.007	0.037	0.006	0.137
Family problem index	0.005	0.119	0.001	0.720	0.012	0.001	0.008	0.036
Woman decide index	0.005	0.089	-0.003	0.413	0.012	0.001	-0.001	0.891
Man decide index	0.005	0.017	0.008	0.008	-0.004	0.202	0.006	0.075
Female planning	0.098	0.311	-0.167	0.146	-0.278	0.017	0.228	0.066
Male planning	-0.378	0.001	0.327	0.018	-0.014	0.919	0.158	0.289
Female selling	0.665	0.001	0.474	0.056	0.665	0.006	0.666	0.022
Female receiving	-0.690	0.001	-0.394	0.112	-0.500	0.039	-0.846	0.003
Female account	0.248	0.006	-0.036	0.748	0.194	0.089	-0.025	0.836
Afraid to disagree	-0.196	0.036	-0.078	0.510	0.039	0.742	-0.130	0.310
Found at risk	0.000	0.720	-0.002	0.292	-0.002	0.202	-0.001	0.566
Intercept	7.825	0.000	3.721	0.000	1.383	0.136	5.795	0.000
N	928		928		928		928	
R-square	0.339		0.268		0.223		0.247	

Sources: PPAP Survey, 2017.

APPENDIX D

COMPLEMENTARY TABLES (COFFEE)

TABLE D-1

Literacy and School Attendance

	FEMALE		MALE		DIFF
	Mean	N	Mean	N	p-value
Literacy (10 years old or more)*					
Total	63.6	973	76.1	1145	0.000
10 to 24 years	88.0	325	89.9	386	0.424
25 to 39 years	58.9	380	81.8	302	0.000
40 to 59 years	45.7	230	64.5	361	0.000
60 or more	**10.5**	**38**	**45.8**	**96**	**0.000**
School attendance (6 to 24 years)					
Total	70.7	417	76.9	484	0.038
6 to 13 years	77.4	159	80.7	197	0.442
14 to 18 years	86.6	142	86.9	160	0.948
19 to 24 years	42.2	116	58.3	127	0.012

Sources: PPAP Survey, 2017. *Reads and write English or Pidgin.

TABLE D-2

School Level and Completion

	FEMALE		MALE		DIFF
	Mean	N	Mean	N	p-value
School level (6 to 24 years)					
None/Kindergarten	30.5	1033	18.4	1216	0.000
Primary	40.8	1033	42.0	1216	0.543
Secondary	26.6	1033	33.7	1216	0.000
University/tertiary	1.9	1033	4.5	1216	0.000
Other	0.2	1033	1.3	1216	0.002
Years completed (among those who stopped studying)	3.5	648	5.0	673	0.000

Sources: PPAP Survey, 2017.

TABLE D-3

Participation, Employment and Unemployment

	FEMALE		MALE		DIFF
	Mean	N	Mean	N	p-value
All (10-69 years old)					
Participation rate	91.4	965	89.1	1115	0.072
Employment rate	94.7	882	92.0	993	0.022
Unemployment rate	0.7	882	1.6	993	0.056
Adult (25-69 years old)					
Participation rate	97.0	640	96.6	729	0.628
Employment rate	96.8	621	93.9	704	0.012
Unemployment rate	0.6	621	1.4	704	0.158

Sources: PPAP Survey, 2017.

TABLE D-4

Employment Characteristics

	FEMALE		MALE		DIFF
	Mean	N	Mean	N	p-value
Schedule					
Full time (35+ hours)	22.6	835	23.0	914	0.865
Part time	77.4	835	77.0	914	0.865
Occupation					
Farmer	78.3	835	67.9	914	0.000
Fisherman	0.0	835	0.1	914	0.317
Hunter	0.0	835	0.0	914	-
Forestry worker	0.1	835	0.2	914	0.613
Services & sales worker	1.8	835	2.8	914	0.144
Clerical worker	0.4	835	2.3	914	0.000
Technician	0.1	835	1.4	914	0.001
Professional	1.3	835	4.5	914	0.000
Manager	0.0	835	0.5	914	0.025
Student	1.6	835	1.3	914	0.669
Other	16.4	835	18.7	914	0.206

	FEMALE		MALE		DIFF
	Mean	N	Mean	N	p-value
Employment status					
Employee (Wage), public sector	1.1	835	4.7	914	0.000
Employee (Wage), private, Coffee	4.9	835	6.3	914	0.192
Employee (Wage), private, other agricultural	5.4	835	3.9	914	0.152
Employee (Wage), private, non-agricultural	1.0	835	1.8	914	0.149
Self-employed, Coffee	13.9	835	39.6	914	0.000
Self-employed, other agricultural	41.0	835	16.1	914	0.000
Self-employed, non-agricultural	4.1	835	3.7	914	0.704
Unpaid family worker	19.0	835	11.4	914	0.000
Apprentice	0.1	835	1.1	914	0.008
NGO	0.0	835	0.1	914	0.317
Coop	0.0	835	0.0	914	-
Student	1.9	835	1.8	914	0.797
Other	7.7	835	9.5	914	0.166

Sources: PPAP Survey, 2017.

TABLE D-5

Reasons for not Working

	FEMALE		MALE		
	Mean	N	Mean	N	p-value
Reasons for not working:					
Domestic work	2.4	84	2.3	129	0.979
Personal / family affairs	2.4	84	0.8	129	0.384
Pregnancy / delivery	2.4	84	0.0	129	0.155
Caring for children	1.2	84	3.9	129	0.197
Illness	0.0	84	1.6	129	0.156
Disability	7.1	84	10.9	129	0.347
Too young	0.0	84	0.0	129	-
Remittances	13.1	84	7.0	129	0.158
Old aged/ pension	64.3	84	66.7	129	0.723
Student	7.1	84	7.0	129	0.963
Other	0.0	84	0.0	129	-

Sources: PPAP Survey, 2017.

TABLE D-6

Household Composition, Income and Satisfaction

	TOTAL		FEMALE HEAD		MALE HEAD		GENDER GAP
	Mean	N	Mean	N	Mean	N	p-value
Main source of income							
Earning from coffee	83.1	668	96.3	27	82.5	641	0.001
Earning from other agriculture products	9.0	668	3.7	27	9.2	641	0.156
Earning from livestock	1.5	668	0.0	27	1.6	641	0.001
Earning from fishing	0.0	668	0.0	27	0.0	641	-
Earning from non-agriculture business	1.8	668	0.0	27	1.9	641	0.000
Salaries/wages/commissions	4.2	668	0.0	27	4.4	641	0.000
Earning from rents (house/ assets/properties)	0.3	668	0.0	27	0.3	641	0.157
Remittances from abroad	0.0	668	0.0	27	0.0	641	-
Domestic remittances	0.0	668	0.0	27	0.0	641	-
Pension	0.0	668	0.0	27	0.0	641	-
Aid in nature / cash	0.0	668	0.0	27	0.0	641	-
Freely from forest	0.0	668	0.0	27	0.0	641	-
Other	0.1	668	0.0	27	0.2	641	0.317
Wealth scale (from 1 the poorest to 10 the richest)							
Today	3.3	667	3.7	27	3.3	640	0.132
Five years ago	2.7	667	2.9	27	2.7	640	0.329
In five years	5.2	667	5.3	27	5.1	640	0.590

	TOTAL		FEMALE HEAD		MALE HEAD		GENDER GAP
	Mean	N	Mean	N	Mean	N	p-value
Income by source							
Coffee cherry	694.4	670	556.8	29	700.6	641	0.721
Coffee parchment	1058.2	670	1091.8	29	1056.7	641	0.903
Coffee green bean	86.3	670	260.0	29	78.4	641	0.325
Off-farm employment	715.7	670	93.4	29	743.9	641	0.028
Non-farm income e.g. trade store. PMV	166.9	670	172.4	29	166.6	641	0.974
Hunting and fishing	70.9	670	0.0	29	74.2	641	0.001
Gifts. Customary payments. remittances	0.0	670	0.0	29	0.0	641	-
Balsa	5.3	670	0.0	29	5.6	641	0.009
Other agricultural	41.9	670	51.7	29	41.4	641	0.849
Other	30.8	670	0.0	29	32.2	641	0.005
Total income per capita	**884.2**	**670**	**710.8**	**29**	**892.1**	**641**	**0.332**
Household composition							
Number of members 12 years and less	0.9	670	0.4	29	0.9	641	0.000
Number of members 13-17 years	0.4	670	0.4	29	0.4	641	0.933
Number of members 18-59 years	2.3	670	1.7	29	2.4	641	0.007
Number of members 60 years and more	0.2	670	0.1	29	0.2	641	0.146

Sources: PPAP Survey, 2017.

TABLE D-7

Who Makes Purchasing Decision, Including Durable Goods?

	WOMAN ALONE		BOTH WOMAN & MAN	
	Estimate	P-value	Estimate	P-value
Hours of domestic work	-0.005	0.226	0,003	0,475
Hours of formal work	0.002	0.951	-0,009	0,827
Share of alternative crop income in total income	-0.001	0.585	0,002	0,523
Hours wage by outsider (female)	0.000	0.982	0,000	0,817
Hours wage by outsider (male)	0.000	0.965	0,000	0,841
Asset wealth index	-0.001	0.418	0,001	0,334
Living in Western Highlands	-0.008	0.873	0,027	0,650
Living in Jiwaka	-0.030	0.464	0,043	0,341
Living in Simbu	0.150	0.002	-0,138	0,008
Married or common law	-0.121	0.107	0,183	0,027
Number of members 12 years and less	-0.003	0.856	0,007	0,653
Number of members 13-17 years	0.002	0.950	0,025	0,392
Number of members 18-59 years	-0.037	0.049	0,057	0,006
Number of members 60 years and more	-0.035	0.428	-0,002	0,968
Participation to agriculture association or group	-0.058	0.318	0,087	0,171
Participation to non-agric association or group	-0.017	0.618	0,037	0,337
Participation to PPAP	-0.086	0.014	0,112	0,004
Age	0.006	0.002	-0,007	0,001
Years of schooling	0.002	0.660	-0,001	0,918
Training on coffee	0.088	0.679	-0,100	0,666
Information on coffee	0.052	0.245	-0,038	0,447
Has a phone	0.040	0.431	-0,009	0,869
Has access to internet	0.266	0.061	-0,261	0,094
Intercept	0.158	0.171	0,695	0,000
N	373		373	
R-square	0.1458		0.1616	

Sources: PPAP Survey, 2017.

TABLE D-8

Trends in Activities (frequencies) Performed by Household Members

	2011			2016			
%	Female	Male	Diff p-value	Female	Male	Diff p-value	Diff-in-diff p-value
Clearing Land	20.3	36.7	0.000	19.1	28.0	0.000	0.005
Transplanting	9.5	22.7	0.000	6.0	14.0	0.000	0.010
Shade establishment and control	3.7	29.3	0.000	4.6	16.9	0.000	0.000
Nursery operations	1.5	6.3	0.000	1.4	2.8	0.022	0.001
Weeding	37.6	57.6	0.000	50.6	52.1	0.520	0.000
Fertilizing/mulching	0.4	4.4	0.000	7.2	10.6	0.010	0.640
Fencing	1.0	8.8	0.000	1.9	5.6	0.000	0.001
Digging / cleaning drains	11.2	37.8	0.000	8.8	22.6	0.000	0.000
Pruning / renovating	6.5	44.8	0.000	10.9	39.7	0.000	0.000
Pest and disease management	0.4	4.6	0.000	0.9	1.4	0.333	0.000
Coffee picking	62.3	63.2	0.664	71.6	69.4	0.275	0.277
Wet milling (pulping and washing)	34.3	42.9	0.000	29.7	41.0	0.000	0.354
Drying (sun drying and bagging)	36.3	42.1	0.004	39.7	38.4	0.554	0.018
Farm record keeping	0.3	1.0	0.032	0.7	0.8	0.785	0.248

Sources: PPAP Survey, 2012-2017.

TABLE D-9

Trends in Activities (days of work) Performed by Household Members

	2011			2016			
	Female	Male	Diff p-value	Female	Male	Diff p-value	Diff-in-diff p-value
Clearing Land	8.6	9.7	0.576	27.5	20.9	0.190	0.154
Transplanting	7.6	7.9	0.794	17.5	12.9	0.529	0.509
Shade establishment and control	5.5	4.8	0.565	16.5	8.7	0.340	0.383
Nursery operations	4.4	8.7	0.012	3.0	22.6	0.089	0.189
Weeding	12.7	10.9	0.061	11.7	10.0	0.178	0.966
Fertilizing/mulching	5.3	7.5	0.213	10.3	17.7	0.295	0.482
Fencing	8.7	7.7	0.687	12.9	6.6	0.489	0.580
Digging / cleaning drains	9.1	8.2	0.663	13.9	12.3	0.704	0.873
Pruning / renovating	7.9	8.1	0.840	7.8	9.1	0.557	0.659
Pest and disease management	11.8	7.3	0.384	1.9	16.9	0.288	0.195
Coffee picking	16.7	16.2	0.619	11.1	9.5	0.162	0.476
Wet milling (pulping and washing)	7.7	7.2	0.498	5.8	5.6	0.809	0.703
Drying (sun drying and bagging)	12.7	11.0	0.183	8.6	8.6	0.904	0.219
Farm record keeping	2.5	1.8	0.629	37.5	22.9	0.576	0.596

Sources: PPAP Survey, 2012-2017.

TABLE D-10

Trends in Activities Performed by Household Members (Frequencies x Days of Work)

	2011			2016			
%	Female	Male	Diff p-value	Female	Male	Diff p-value	Diff-in-diff p-value
Clearing Land	1.7	3.5	0.001	5.3	5.8	0.624	0.358
Transplanting	0.7	1.8	0.000	1.0	1.8	0.211	0.604
Shade establishment and control	0.2	1.4	0.000	0.8	1.5	0.101	0.319
Nursery operations	0.1	0.5	0.000	0.0	0.6	0.079	0.648
Weeding	4.8	6.3	0.002	5.9	5.2	0.302	0.008
Fertilizing/mulching	0.0	0.3	0.000	0.7	1.9	0.138	0.276
Fencing	0.1	0.7	0.000	0.2	0.4	0.519	0.045
Digging / cleaning drains	1.0	3.1	0.000	1.2	2.8	0.002	0.391
Pruning / renovating	0.5	3.6	0.000	0.9	3.6	0.000	0.539
Pest and disease management	0.1	0.3	0.000	0.0	0.2	0.275	0.790
Coffee picking	10.5	10.3	0.789	8.0	6.6	0.107	0.294
Wet milling (pulping and washing)	2.6	3.1	0.118	1.7	2.3	0.009	0.730
Drying (sun drying and bagging)	4.6	4.6	0.955	3.4	3.3	0.798	0.857
Farm record keeping	0.0	0.0	0.087	0.3	0.2	0.727	0.685

Sources: PPAP Survey, 2012-2017.

TABLE D-11

Trends in Activities Performed by Outsiders

	2011			2016			
	Female	Male	Diff p-value	Female	Male	Diff p-value	Diff-in-diff p-value
Hours of paid labour by outsiders	253.3	834.5	0.420	13.3	34.3	0.308	0.437
Average hourly wage for outsiders (PGK)	0.7	1.7	0.275	47.3	83.9	0.464	0.476

Sources: PPAP Survey, 2012-2017.

TABLE D-12

Activity-Based Decision Making

	2011			2016			
%	Female	Male	Diff p-value	Female	Male	Diff p-value	Diff-in-diff p-value
Primarily involved in selling livestock	-	-	-	5.6	21.6	0.000	-
Primarily involved in selling coffee	5.5	30.1	0.000	6.6	39.2	0.000	0.000
Primarily involved in receiving payments for coffee	17.9	13.6	0.000	8.7	37.4	0.000	0.000
Involved in planning and decision making about coffee production	27.6	37.4	0.000	35.7	50.4	0.000	0.050
Operate the account	2.0	8.4	0.000	1.6	11.3	0.000	0.004

Sources: PPAP Survey, 2012-2017.

TABLE D-13

OLS Regressions on Time-Use (Women)

	TOTAL HOURS OF WORK		PRIMARY PRODUCTION		FORMAL WORK		NON-PRIMARY PRODUCTION		DOMESTIC WORK		LEARNING		PERSONAL CARE	
	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value
Age	0.026	0.301	0.012	0.607	0.002	0.371	0.011	0.368	-0.066	0.007	-0.016	0.001	-0.023	0.387
Years of schooling	-0.052	0.560	-0.074	0.384	0.029	0.004	-0.007	0.874	-0.070	0.425	0.037	0.036	-0.044	0.642
Literacy in English	1.548	0.011	1.911	0.001	-0.127	0.057	-0.236	0.438	-0.463	0.440	-0.035	0.773	-0.299	0.646
Literacy in Pidgin	-1.488	0.014	-1.607	0.005	-0.101	0.130	0.220	0.466	0.493	0.408	-0.144	0.232	0.259	0.688
Training on coffee	-0.788	0.715	-0.399	0.845	1.345	0.000	-1.733	0.108	-1.840	0.386	-0.486	0.259	-1.626	0.481
Information on coffee	-1.371	0.019	-1.645	0.003	0.116	0.068	0.158	0.585	0.254	0.656	-0.191	0.099	-1.129	0.069
Has a phone	1.082	0.084	0.658	0.267	0.006	0.935	0.418	0.180	-0.994	0.106	0.100	0.421	0.038	0.955
Has access to internet	-2.508	0.112	-3.118	0.038	1.491	0.000	-0.881	0.263	-1.256	0.418	1.957	0.000	-1.233	0.464
Female head	1.555	0.187	1.532	0.170	0.178	0.169	-0.154	0.793	2.803	0.016	-0.025	0.916	1.727	0.170
Married or common law	1.482	0.209	0.853	0.446	0.210	0.105	0.419	0.477	0.589	0.612	-0.020	0.932	-1.001	0.427
Number of members 12 years and less	0.289	0.102	0.116	0.488	0.007	0.721	0.166	0.061	0.623	0.000	0.011	0.754	0.607	0.001
Number of members 13-17 years	0.180	0.586	0.050	0.873	0.049	0.172	0.080	0.627	-0.291	0.369	0.206	0.002	0.621	0.079
Number of members 18-59 years	-0.165	0.489	0.110	0.628	-0.042	0.106	-0.232	0.052	0.084	0.721	0.173	0.000	0.362	0.156
Number of members 60 years and more	-0.020	0.970	0.326	0.525	-0.077	0.193	-0.268	0.320	-0.392	0.461	0.548	0.000	0.288	0.618
Hours wage by outsider (female)	0.020	0.369	0.012	0.570	0.001	0.751	0.007	0.514	0.005	0.833	-0.006	0.211	-0.004	0.850
Hours wage by outsider (male)	-0.018	0.423	-0.012	0.560	-0.001	0.716	-0.005	0.675	-0.007	0.729	0.005	0.243	0.006	0.811
Participation to agriculture association or group	-0.120	0.861	0.027	0.967	-0.130	0.087	-0.017	0.960	1.035	0.127	0.015	0.915	0.155	0.834
Participation to non-agric association or group	-0.129	0.772	0.034	0.935	0.019	0.694	-0.183	0.412	-0.369	0.400	0.142	0.110	-0.948	0.047

Participation to PPAP	-0.768	0.073	-0.356	0.380	-0.016	0.728	-0.395	0.065	1.147	0.007	0.094	0.271	-0.157	0.731
Asset wealth index	0.039	0.010	0.031	0.029	0.002	0.210	0.005	0.465	0.058	0.000	-0.005	0.102	0.037	0.022
Living in Western Highlands	-0.914	0.174	-0.908	0.155	0.080	0.280	-0.087	0.796	1.126	0.089	-0.289	0.031	0.998	0.165
Living in Jiwaka	2.064	0.000	1.658	0.002	0.022	0.716	0.384	0.169	1.635	0.003	-0.206	0.065	2.977	0.000
Living in Simbu	-0.838	0.205	-0.579	0.356	0.026	0.716	-0.285	0.387	1.377	0.035	-0.167	0.205	1.113	0.116
Permission index	0.011	0.078	0.004	0.453	-0.001	0.416	0.007	0.022	0.006	0.327	-0.001	0.418	0.009	0.176
Agreement index	-0.008	0.405	-0.007	0.458	-0.002	0.054	0.001	0.868	0.014	0.152	-0.005	0.008	0.001	0.961
Family problem index	-0.031	0.026	-0.030	0.024	0.005	0.002	-0.006	0.377	0.031	0.025	-0.002	0.512	-0.021	0.148
Decision index (woman decide)	0.016	0.148	0.003	0.789	-0.001	0.413	0.014	0.010	-0.031	0.005	0.001	0.761	-0.024	0.046
Decision index (partner decide)	-0.021	0.026	-0.003	0.756	0.000	0.640	-0.018	0.000	0.003	0.723	-0.002	0.194	-0.033	0.001
Female Involved in planning and decision making about coffee production (household level variable	0.158	0.757	0.112	0.818	0.044	0.430	0.002	0.993	0.605	0.230	-0.124	0.223	1.245	0.023
Male Involved in planning anddecision making aboutcoffee production (household level variable)	-0.240	0.825	1.064	0.302	-0.135	0.259	-1.169	0.032	-0.329	0.758	0.363	0.094	1.619	0.164
Female Primarily involved in selling coffee (household level variable)	0.024	0.979	0.532	0.546	-0.215	0.036	-0.293	0.527	0.944	0.302	-0.217	0.241	-0.521	0.600
Female Primarily involved in receiving payments for coffee (household level variable)	-0.887	0.295	-0.846	0.292	-0.085	0.362	0.043	0.918	-0.895	0.283	0.496	0.003	0.545	0.547
Female manage account (household level variable)	0.145	0.901	-0.565	0.610	0.313	0.015	0.397	0.496	-0.881	0.443	0.016	0.946	1.312	0.294
Afraid to disagree	0.552	0.378	0.283	0.634	0.029	0.670	0.240	0.442	-0.466	0.449	-0.129	0.302	-0.836	0.212
Found at risk	0.001	0.851	0.003	0.630	-0.001	0.364	-0.001	0.735	-0.005	0.392	0.002	0.110	-0.003	0.679
Intercept	2.123	0.262	1.149	0.522	0.076	0.716	0.899	0.341	3.078	0.099	0.449	0.234	10.840	0.000
N R-square	383 0.2192		383 0.202		383 0.4743		383 0.1512		383 0.2594		383 0.3117		383 0.2734	

Sources: PPAP Survey, 2017.

TABLE D-14

OLS Regressions on Time-Use (Men)

	TOTAL HOURS OF WORK		PRIMARY PRODUCTION		FORMAL WORK		NON-PRIMARY PRODUCTION		DOMESTIC WORK		LEARNING		PERSONAL CARE	
	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value
Age	-0.042	0.219	-0.027	0.399	0.006	0.668	-0.022	0.168	0.003	0.846	-0.003	0.165	0.025	0.357
Years of schooling	-0.068	0.536	-0.089	0.380	0.015	0.740	0.006	0.911	0.007	0.872	-0.009	0.240	-0.126	0.150
Literacy in English	0.222	0.809	0.163	0.847	-0.098	0.797	0.157	0.710	0.599	0.102	0.060	0.344	0.469	0.522
Literacy in Pidgin	-0.720	0.435	-0.248	0.770	0.041	0.915	-0.513	0.225	-0.210	0.565	-0.017	0.782	0.409	0.576
Training on coffee	0.837	0.355	0.564	0.498	-0.150	0.689	0.423	0.309	-0.416	0.247	0.071	0.251	-1.047	0.146
Information on coffee	-0.479	0.470	-1.387	0.023	0.367	0.181	0.542	0.075	0.169	0.520	-0.037	0.417	-0.525	0.318
Has a phone	-0.185	0.792	-0.193	0.764	0.034	0.906	-0.026	0.935	0.028	0.918	0.043	0.368	-0.342	0.538
Has access to internet	1.646	0.401	0.446	0.805	0.679	0.403	0.522	0.561	-0.580	0.455	-0.054	0.687	-1.446	0.353
Female head	2.347	0.303	1.897	0.365	0.012	0.990	0.437	0.675	0.416	0.645	-0.070	0.654	0.506	0.780
Married or common law	5.872	0.035	5.245	0.040	0.412	0.719	0.215	0.866	0.228	0.836	-2.352	0.000	-0.970	0.659
Number of members 12 years and less	0.162	0.540	0.036	0.883	0.165	0.133	-0.039	0.750	0.240	0.023	-0.004	0.808	0.624	0.003
Number of members 13-17 years	0.159	0.753	0.778	0.095	-0.218	0.299	-0.401	0.084	-0.512	0.011	0.027	0.429	0.049	0.902
Number of members 18-59 years	0.325	0.394	0.437	0.213	0.043	0.783	-0.155	0.375	-0.040	0.792	-0.001	0.976	0.516	0.090
Number of members 60 years and more	0.085	0.931	0.787	0.387	-0.384	0.348	-0.317	0.484	0.097	0.805	0.061	0.367	0.800	0.308
Hours wage by outsider (female)	0.623	0.556	1.302	0.181	-0.006	0.988	-0.673	0.166	0.398	0.342	0.073	0.315	0.853	0.309
Hours wage by outsider (male)	-1.177	0.087	-1.221	0.053	-0.073	0.796	0.117	0.709	0.169	0.533	-0.030	0.528	0.499	0.359
Participation to agriculture association or group	-0.763	0.262	-0.689	0.270	-0.060	0.831	-0.014	0.965	0.102	0.705	-0.029	0.535	-0.055	0.919
Participation to non-agric association or group	0.020	0.367	-0.011	0.592	0.015	0.099	0.016	0.123	0.002	0.844	-0.001	0.414	0.025	0.158

Participation to PPAP	1.416	0.218	1.412	0.182	0.056	0.906	-0.051	0.922	0.772	0.091	0.064	0.413	0.770	0.399
Asset wealth index	2.889	0.001	2.098	0.009	0.166	0.644	0.625	0.117	0.622	0.071	0.008	0.896	1.184	0.086
Living in Western Highlands	0.323	0.765	0.354	0.721	0.470	0.293	-0.501	0.311	0.650	0.129	-0.035	0.640	0.327	0.702
Living in Jiwaka	0.010	0.323	0.011	0.239	0.001	0.766	-0.002	0.634	-0.002	0.524	-0.001	0.074	-0.003	0.693
Living in Simbu	0.021	0.176	0.019	0.185	-0.006	0.380	0.008	0.277	0.010	0.115	0.002	0.157	0.015	0.232
Permission index	-0.025	0.246	-0.033	0.098	-0.009	0.289	0.017	0.081	-0.002	0.797	-0.003	0.058	-0.018	0.285
Agreement index	0.015	0.405	0.003	0.876	0.002	0.735	0.010	0.231	0.004	0.538	0.000	0.758	0.003	0.836
Family problem index	-0.056	0.001	-0.033	0.037	-0.001	0.860	-0.022	0.006	-0.011	0.114	0.002	0.165	-0.041	0.003
Decision index (woman decide)	-1.622	0.029	-1.110	0.103	-0.119	0.698	-0.393	0.246	0.577	0.050	-0.040	0.425	1.039	0.077
Decision index (partner decide)	-9.576	0.033	-11.759	0.005	0.614	0.739	1.569	0.444	0.388	0.826	-0.139	0.649	-3.466	0.329
Female Involved in planning and decision making about coffee production (household level variable)	1.187	0.444	0.001	1.000	0.311	0.627	0.875	0.219	-0.421	0.493	0.142	0.183	1.456	0.237
Male Involved in planning and decision making about coffee production (household level variable)	-1.562	0.278	-1.112	0.400	-0.247	0.678	-0.204	0.757	-0.247	0.665	0.110	0.264	-0.574	0.615
Female Primarily involved in selling coffee (household level variable)	-0.086	0.959	0.831	0.582	-0.748	0.273	-0.169	0.823	0.327	0.616	-0.025	0.826	1.734	0.185
Female Primarily involved in receiving payments for coffee (household level variable)	1.692	0.180	1.612	0.164	0.234	0.653	-0.155	0.788	1.141	0.023	-0.059	0.496	1.119	0.263
Female manage account (household level variable)	-0.004	0.767	0.000	0.975	-0.001	0.912	-0.004	0.543	-0.006	0.329	0.002	0.045	-0.034	0.004
Afraid to disagree	12.137	0.026	13.068	0.009	-1.136	0.612	0.205	0.934	-1.305	0.543	2.492	0.000	12.112	0.005
Found at risk	-0.042	0.219	-0.027	0.399	0.006	0.668	-0.022	0.168	0.003	0.846	-0.003	0.165	0.025	0.357
Intercept	-0.068	0.536	-0.089	0.380	0.015	0.740	0.006	0.911	0.007	0.872	-0.009	0.240	-0.126	0.150
N R-square	243 0.2199		243 0.2407		243 0.0828		243 0.2007		243 0.2314		243 0.5525		243 0.3169	

Sources: PPAP Survey, 2017.

TABLE D-15

Household Coffee Production Regressions

	YIELD OF COCOA		INCOME PER TREE		NUMBER OF TREES		QUALITY OF PRUNING	
	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value
Inc. share alt. crop	-0.119	0.730	-0.006	0.867	-38.9	0.112	-0.267	0.169
Hrs. domestic work	-0.998	0.652	0.163	0.453	-238.3	0.128	0.791	0.518
Female * Hrs dom work	0.251	0.908	-0.121	0.570	186.2	0.225	-0.823	0.492
Hrs. formal work	-2.789	0.227	-0.234	0.302	96.8	0.553	3.817	0.005
Female * Hrs formal work	-0.195	0.977	-0.532	0.434	1416.9	0.004	-8.112	0.034
Asset wealth index	0.057	0.771	0.009	0.631	72.6	0.000	0.203	0.058
Living in Western Highlands	7.670	0.412	-2.746	0.003	-1182.8	0.071	-9.123	0.082
Living in Jiwaka	-0.820	0.910	-0.577	0.417	-1519.7	0.003	-14.343	0.000
Living in Simbu	36.719	0.000	-2.074	0.015	-161.8	0.793	-8.749	0.071
Female head	78.512	0.000	-0.302	0.857	126.4	0.916	4.040	0.667
Married or common law	37.488	0.024	1.037	0.525	1298.8	0.269	8.649	0.346
HHSize 12-	0.524	0.823	-0.064	0.781	-7.0	0.966	5.079	0.000
HHSize 13-17	-7.342	0.093	-0.023	0.957	-567.8	0.066	1.382	0.569
HHSize 18-59	4.791	0.136	0.862	0.006	-76.3	0.736	4.114	0.020
HHSize 60+	-3.209	0.663	-0.480	0.508	1956.6	0.000	-1.279	0.754
Particip. agric group	-4.823	0.582	0.923	0.284	-1853.6	0.003	2.784	0.562

Particip. non-agric group	-4.947	0.368	0.870	0.107	442.6	0.254	-0.754	0.806
Participation to PPAP	-9.472	0.099	0.339	0.548	-1876.6	0.000	-6.770	0.035
Permission index	-0.023	0.770	0.015	0.053	8.8	0.110	0.074	0.089
Agreement index	-0.340	0.015	-0.062	0.000	13.8	0.164	-0.109	0.183
Family problem index	-0.357	0.049	-0.041	0.021	-29.8	0.020	-0.094	0.352
Woman decide index	0.105	0.477	0.029	0.046	-61.1	0.000	-0.066	0.433
Man decide index	0.166	0.216	0.017	0.200	0.2	0.986	-0.057	0.447
Female planning	2.637	0.691	0.120	0.854	-778.3	0.096	2.440	0.510
Male planning	13.805	0.423	-8.099	0.000	764.7	0.530	5.108	0.591
Female selling	-10.316	0.425	-1.162	0.361	594.2	0.516	-20.210	0.005
Female receiving	-4.409	0.700	-2.060	0.067	72.7	0.928	17.479	0.006
Female account	-1.087	0.944	-1.884	0.214	964.9	0.376	7.333	0.386
Afraid to disagree	7.290	0.417	1.263	0.152	-90.3	0.887	-1.911	0.704
Found at risk	0.071	0.428	0.002	0.823	-1.7	0.793	0.013	0.791
Intercept	-31.208	0.310	8.789	0.002	5986.0	0.336	8.016	0.736
N	578		578		580		556	
R-square	0.373		0.147		0.279		0.131	

Sources: PPAP Survey, 2017.

TABLE D-16

Household Welfare Regressions – Coffee-Growing Areas

	INCOME PER CAPITA (LOG)		WEALTH SCALE TODAY		WEALTH SCALE 5 YEARS AGO		WEALTH SCALE IN 5 YEARS	
	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value
Inc. share alt. crop	-0.035	0.000	0.018	0.014	0.037	0.000	-0.024	0.003
Hrs. domestic work	-0.021	0.584	0.006	0.892	0.015	0.797	0.042	0.456
Female * Hrs dom work	0.036	0.331	-0.052	0.271	-0.064	0.266	-0.062	0.260
Hrs. formal work	0.108	0.007	0.008	0.876	-0.015	0.798	-0.007	0.899
Female * Hrs formal work	0.076	0.521	-0.118	0.419	0.091	0.610	-0.633	0.000
Asset wealth index	0.028	0.000	0.028	0.000	0.007	0.134	0.049	0.000
Living in Western Highlands	-0.418	0.008	0.034	0.864	0.779	0.001	0.049	0.829
Living in Jiwaka	0.170	0.171	0.012	0.936	0.544	0.003	-0.586	0.001
Living in Simbu	-0.514	0.000	-0.210	0.243	-0.484	0.027	1.440	0.000
Female head	-0.032	0.914	0.327	0.364	0.469	0.285	0.880	0.034
Married or common law	0.007	0.979	0.414	0.232	0.292	0.489	0.878	0.026
HHSize 12-	-0.307	0.000	-0.121	0.012	0.008	0.891	0.050	0.380
HHSize 13-17	-0.315	0.000	-0.139	0.128	-0.032	0.774	-0.051	0.630
HHSize 18-59	-0.143	0.009	-0.027	0.691	0.181	0.027	0.058	0.444
HHSize 60+	-0.426	0.001	-0.156	0.306	-0.166	0.372	0.004	0.981

Particip. agric group	-0.173	0.252	-0.249	0.182	-0.050	0.826	-0.996	0.000
Particip. non-agric group	0.212	0.023	0.079	0.491	0.039	0.779	-0.067	0.609
Participation to PPAP	-0.072	0.455	0.095	0.420	0.299	0.038	-0.215	0.113
Permission index	-0.001	0.703	0.011	0.000	0.011	0.000	0.003	0.124
Agreement index	0.005	0.031	-0.022	0.000	-0.028	0.000	-0.029	0.000
Family problem index	0.001	0.740	-0.007	0.069	-0.012	0.007	0.002	0.667
Woman decide index	0.009	0.000	0.019	0.000	0.010	0.011	0.016	0.000
Man decide index	-0.005	0.025	-0.001	0.775	0.006	0.089	0.006	0.060
Female planning	0.062	0.589	0.392	0.005	0.403	0.017	0.321	0.049
Male planning	0.430	0.144	-0.254	0.486	-0.929	0.037	0.014	0.973
Female selling	0.126	0.566	-0.437	0.095	-0.480	0.133	-0.701	0.025
Female receiving	-0.095	0.617	0.003	0.989	-0.240	0.395	0.048	0.863
Female account	-0.185	0.469	-0.108	0.729	-0.515	0.175	-0.141	0.680
Afraid to disagree	-0.063	0.679	0.011	0.951	-0.143	0.527	0.517	0.014
Found at risk	-0.002	0.150	0.003	0.084	0.004	0.094	0.002	0.268
Intercept	5.930	0.000	2.418	0.002	2.895	0.000	4.517	0.000
N	602		600		600		600	
R-square	0.329		0.308		0.274		0.443	

Sources: PPAP Survey, 2017.

Photo: PPAP, PNG

APPENDIX E

LITERATURE REVIEW

Economic literature sets minimum principles from which a theory of household behavior could be drawn. This is important since meaningful models of the family can be used to predict future demographic trends (or understand past ones) or to analyze the effect of policies on household decision making (including female labor supply, fertility, intra-household inequality, etc.). The standard unitary model, which treats multi-person households as a single decision maker, has been abundantly rejected (Browning and Chiappori 1998; Lundberg, Pollak and Wales 1997). Its most convincing replacement, the collective model, respects individual preferences and relies on the sole assumption of efficiency of household decisions (Chiappori 1988 and 1992). Other cooperative models in which the bargaining model is specified, i.e. in which further axioms to efficiency are assumed, do not necessarily offer additional testable restrictions than those stemming from the efficiency assumption (Chiappori, Donni and Komunjer 2011).

Over the past twenty years, most of the research effort on this topic has been dedicated to testing efficiency (Chiappori and Donni 2006). In fact, this assumption is justified by the main authors in this literature by the Folk THEOREM: efficiency stems from a repeated non-cooperative game between players with the perfect symmetry of information. Yet, at least two other streams of the literature come to contradict this view. Some authors argue that the conditions under which efficiency can be presumed are specific: many decisions in life are too rare, too engaging or too irreversible to allow cooperation (e.g., location decisions, work decisions, fertility, etc.). In contrast, strategic decisions are expected to take place (Lundberg and Pollak 1994), and the outcome is expected to be inefficient (Lundberg and Pollak 1993 and 2001; Chen and Wooley 2001, and Haddad and Kanbur 1994).

Another, more extreme view, is that couples are fundamentally non-cooperative. Tests of efficiency in developing countries tend to support this view. They mainly concern productive decisions among agricultural households (Udr 1996; Duflo and Udry 2004). For instance, Carter and Katz (1997) remind us that gender-based norms, divisions, and conflicts are important in the determination of household resource allocation. This latter view states that the household is better conceived as consisting of separate, gendered spheres of decision making and activity that are related to one another by a "conjugal contract" — the terms under which household members exchange goods, incomes, and services among themselves. Quinsumbing and Maluccio (2000) found that the central role of women is determining household well-being, and that when higher relative resources are controlled by women they tend to increase the shares spent on the education of children.

Considering possible non-cooperative behaviors within the household, important research questions need to be asked about the way individuals trade their time on the market as well as within the household. In particular: how individuals produce satisfaction with time and goods? And, how various activities aggregate to produce well-being? Whether domestic time can be attributed value or not isn't important in order to assess the impact of time-use on well-being (Aguiar et al. 2013). Valuing domestic time allows us to estimate a complete income that is far less unequally distributed than a monetary income. Valuing domestic (or leisure) time can diminish by about 20-30 percent household inequality measured on complete income instead of monetary income. During the great recession in the US, satisfaction decreased by about 6 percent whereas income decreased by 10-12 percent; this relatively low elasticity can be explained by the fact that monetary income losses have been compensated by more domestic activities and leisure time. Also, it is important to measure the value of non-market activities to explain well-known paradoxes such as the Easterlin paradox which considers that household life-satisfaction does not generally improve when monetary income increases (although household satisfaction might improve when complete income increases or relative income increases).

Time poverty can be understood as the fact that some individuals do not have enough time for rest and leisure after taking into account the time spent working, whether in the labor market, for domestic work, or for other activities such as fetching water and wood (Bardasi and Wodon 2005). The availability of better data on time-use in developing countries makes the possibility to measure time poverty for a wide range of countries.[4] Other important research has been done on the impact of technological change on the value of time. In some cases, the diversity of activities may reduce the total amount of time available for one particular activity and in others, technological change can increase time availability due to the decrease of domestic work. All these time-use changes have an impact on household satisfaction. In developing countries, many activities (such as socio-cultural, community or domestic activities) are not valued by the market, although they are valued by the individuals and communities. Thus, it is important to measure the extent of these activities in order to better assess the impact of various exogenous changes on both time-use and well-being.

4. The linear regression model was a useful method to analyze correlations and a powerful tool for causality analysis with non-experimental data. See http://timeuse-2009.nsms.ox.ac.uk/information/studies/ for further information.

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