

Differential effects of wage on intra-household time allocation in Ghana.

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Abstract

This paper examines the effects of wage on intra-household time allocation to paid and unpaid work with focus on gender and geographical differences. We pool data on male and females aged 15 years and above from the last three rounds of the Ghana Living Standard Survey (GLSS4, GLSS5 and GLSS6) and apply the Instrumental Variables Tobit (IV Tobit) estimation techniques to correct potential endogeneity in wage. The descriptive analysis shows a considerable reduction in time allocation to unpaid work from 1998 to 2013. Although the gap has narrowed across gender and geographical location, females and rural residents still spend more time on unpaid work than males and urban residents. The regression analysis reveals that wage reduces unpaid hours of work for both male and females as well as rural and urban residents. However, the results remain significant for only females and rural residents although these categories of respondents receive lower average wage than males and urban residents. Wage has negative effect (income effect) on labour supply of females but positive effect (substitution effect) for males, as well as rural and urban residents. Real wage has higher effects on hours of unpaid work than nominal wage while nominal wage has higher effect on paid work than real wage, suggesting an element of money illusion. These differential effects of wages require that government policies that seek to use wage as an instrument to achieve gender and spatial equality in labour force participation, labour supply and household production must critically consider these factors.

JEL Classification: D13, J16, J22, J31.

Keywords: Wage, intra-household time allocation, Instrumental Variable Tobit, endogeneity.

Introduction

Changes in wage have consequential effect on time allocation decision of individuals in a household. It is intuitively expected that high wages should provide an incentive for household members to pursue market work while accumulating experience needed for human capital development (Korenman, Liao, & O'Neill, 2005). However, theoretical explanation shows that it is a priori difficult to specify the direction of this effect since the income and substitution effects of a wage increase work in opposite directions. This leaves the direction of the effect dependent on the proportion on which individual's labour supply function is located (Ilahi, 2000). This ambiguity partly contributes to the mixed empirical evidence of the wage effect at the individual, household and regional levels. Ilahi (2000) has noted that in south Asia, where rural labour markets function better than in Africa or Latin America, the wage effect of female labour supply to market activities is higher. Nonetheless, evidence suggest that as families acquire higher income, they may prefer to pay attention to household production that enhances the wellbeing of the members and this mostly becomes the responsibility of the mother (Korenman et al., 2005). This means that wage may have a differential impact on the time allocation of men and women to different paid and unpaid work activities depending on other individual, household level characteristics and country specific context (Bloemen & Stancaelli, 2014b) .

Though the theory of household production is inconclusive on the direction of the effects of wage on intra-household time allocation (Blackden & Wodon, 2006; Bloemen & Stancaelli, 2014a), there is enough evidence that women who are "time poor" are usually limited in their ability to invest time in expanding their capabilities and build their human capital. This in turn affects the wellbeing of these women and their future opportunities (Chant, 2008; Gammage, 2010). Unequal distribution of responsibilities for unpaid work between women and men within the household also translates into unequal opportunities in terms of time to participate equally in paid activities (Ferrant, Pesando, & Nowacka, 2014).

Time use encompasses the activities done by different individuals from a representative selection of households, and the time spent on each activity which is measured in terms of the number of minutes or hours within a 24-hour period (Ghana Statistical Service, 2012). Time use analysis has been related to unpaid care and gender inequality. It reflects how gender roles attributed to women and men, girls and boys, shape the division of labour within a household while social norms define certain activities as more feminine or more masculine than others (Ferrant, 2015). Global statistics show that women spend at least twice as much time in unpaid domestic work as men, and the disparity is much greater in many developing countries (United

Nations, 2010). Women employed outside the home work significantly more hours than men due to the double burden of paid work and unpaid domestic responsibilities (USAID, 2015).

In the Ghanaian context, the Ghana Statistical Service report in 2012 on time use show marked gender difference in time allocation to paid and unpaid work. Women spend an average of 3 hours and 29 minutes per day on unpaid work which is more than 3 times the average time spent by men (69 minutes) on the same activities. In terms of remunerated work, men were found to spend far more time on work for formal establishments such as corporations and government (65 minutes) than women (23 minutes). In contrast, women reported spending more time on unpaid household work (2 hours and 35 minutes) than men who spend 40 minutes per day on the same activity (Ghana Statistical Service, 2012).

In spite of the implications of the changes in wage for intra-household time allocation and time poverty there is on empirical literature on Ghana. This paper fills this existing knowledge gap by examining the effects of wage on intra-household allocation of time to paid and unpaid work activities using data from the last three round of the Ghana Living Standard Survey. The results from the Instrumental Variable Tobit (IV Tobit) estimation regression analysis reveals that wage reduces unpaid hours of work for both male and females as well as rural and urban residents. However, the results remain significant for only females and rural residents in spite of the fact that these categories of respondents receive lower average wage than males and urban residents. Wage has negative effect (income effect) on the labour supply of females but positive effect (substitution effect) for males, as well as rural and urban residents. Nationally, the wage effect is positive since the substitution effect outweighs the income effect. The next section of the paper presents a brief overview of the literature on wage-intra-household time allocation nexus. This is followed by an explanation of the methodology used in the estimation, and presentation of the results and discussion. The final section concludes and presents the policy recommendations.

Overview of the literature on wage-intra-household time allocation nexus

The literature on the relationship between wage and intra-household time allocation is still in its nascent stage in developing countries and particularly Ghana probably due to the dearth of surveys that gather information on wage and time use at the household level. The little available evidence suggest that the examination of this relationship involves a number of complexities including: 1) the need to disentangle own-wage effect from cross-wage effect especially in a two-earner (husband and wife) household; and 2) the perceived existence of potential endogeneity (reverse causality) between wage and time allocation to paid and unpaid household work (Hersch, 2009). Other issues highlighted in the literature have to do with the decision to consider a single

household activity at time or an aggregate of more than one household activity as a measure of household work, and whether to use variables from time-use surveys or regular surveys in computing the estimates of hours of work (Klevmarken, 2005).

Extant literature provides varied results of studies that seek to achieve similar objectives depending on several factors such as the scope of the study in question, the type of estimation technique, data used, the presence or otherwise of unobserved heterogeneities emanating from cultural and social norms as well as socioeconomic conditions under which the studies were carried out. However, what is conspicuous from the literature is that increases in own wage has positive effects on time allocated to paid work by both men and women but the responsiveness of women's time is higher. The cross-wage effects on time allocation of partners in the household in particular is stronger for mothers' child care. High wages of fathers are associated with more hours spent on childcare by mothers but an increase in mothers' wages does not necessarily increase father's hours spent on childcare (Garcia, Molina, & Montuenga, 2009).

In the African context, literature on the relationship between wage and intra-household time allocation remains limited. The few available studies that have explored the impact of an array of non-wage related factors such as an exogenous increase in non-market income (Ranchhod & Wittenberg, 2007), environmental degradation (Dimoso & Antonides, 2008), and differences in time allocation to various household activities from the perspective of gender, age and geographical location (Arbache, Kolev, & Filipiak, 2010; Floro & King, 2016). Others have also looked at the pattern of children's time allocation to labour and schooling (Bock, 2002) and the effect of employment status on gender time allocation to paid work (Komatsu & Floro, 2016).

From a Ghanaian perspective, there is no study on the relationship between intra-household time use and wage, although data on time use has been a component of the time use and employment module of all the rounds of the Ghana Living Standard Surveys since 1987. As in the case of most Africa countries, the identified studies on time use have focused on a wide range of socioeconomic factors but none has considered the effect of wage. The issues covered are the impacts of infrastructure such as electricity and water on time use by men and women (Costa, Hailu, Silva, & Tsukada, 2009; Coulombe & Wodon, 2008). Another closely-related study (but different in scope) that has looked at time use is Morka (2015) who examined the factors that determine domestic and market time use of children and the impact that these activities have on their school attendant.

Methodology

Empirical estimation strategy

In this study, there are a number of econometric issues that need to be addressed on wage and hours of work in order to at least minimise any potential biases of the estimates. Wage is endogenous in hours of work due to the possibility of measurement error, omitted variable bias and reverse causality (Sedigh, Devlin, Grenier, & Armstrong, 2016). Hall (1973) has indicated that wage may be unobserved for individuals who, for some reason decide not to enter into the labour force. Omitting the data for these category of people has the potential to cause the estimates of wage to be downwardly biased since those omitted observations may cause negative disturbances. As usual characteristics of time use data, the dependent variables (hours of work) are censored at zero. Some studies have handled this problem by using the Tobit estimation technique which considers all those zeros as an outcome of a choice of the respondent (Daunfeldt & Hellström, 2007). However, evidence suggests that the type of survey, the method of data collection and the type of measurement of the variable can also contribute to such zero observations.

In the case of this study, we face the problems of endogeneity of wage and considerably high proportion of zero observations which may be attributed to the data collection and generation process, as well as the choice of the respondent. In order to address these problems simultaneously, we adopt the instrumental variable Tobit (IV Tobit) estimation approach. Specifically, we use the Pooled Tobit approach to account for the time-varying part (assumed to be common for all cross-sectional units) by introducing the time dummy for the years of the three rounds of the survey (Wooldridge, 2010). The IV Tobit estimation technique requires the specification of two structural equations. From equation 5 or 5a, we specify the outcome equation as:

$$H_{it} = \alpha_0 + W_{it}\beta + X_{it}\delta + \mu_{it} \quad \text{for } \begin{cases} i = 1 \dots n \\ t = 2005/6 \dots 2012/13 \end{cases} \quad (1)$$

where H_{it} represents a vector of the endogenous dependent variables (number of hours spent on paid and unpaid work per week by an individual i at time t); α_0 is the intercept; W_{it} is a vector of the continuously observed endogenous explanatory variables (wage of individual i at time t). It is the same as the predicted fitted values from the first stage regression; β is the unbiased and consistent estimation on the average effect of wage on hours of work; X_{it} is a vector of the explanatory variables including non-wage income; while the residual μ_{it} is independently distributed. From equation 9, we can derive the first stage estimation equation as:

$$W_{it} = Z_{it}\pi_z + X_{it}\pi_w + v_{it} \quad (2)$$

where X_{it} is the same vector of explanatory variables and Z_{it} is the vector of the excluded regressors from the outcome equation with dimensions $1 \times k_w$ and $1 \times k_z$ respectively; v_{it} is the independently distributed residual. In an expanded format, we specify our estimated outcome equations as:

$$\text{Hoursunpaid}_{it} = \alpha_0 + \beta_1 \text{wage}_{it} + \beta_2 \ln \text{remit}_{it} + \beta_3 \text{Age}_{it} + \beta_4 \text{Mstatus}_{it} + \beta_5 \text{Healthstatus}_{it} + \beta_6 \text{RHH}_{it} + \beta_7 \text{Child}_{it} + \beta_8 \text{Urban}_{it} + \beta_9 \text{Female} + \mu_{it} \quad (3)$$

$$\text{Hourspaid}_{it} = \alpha_0 + \beta_1 \ln \text{wage}_{it} + \beta_2 \ln \text{remit}_{it} + \beta_3 \text{Age}_{it} + \beta_4 \text{Agesq}_{it} + \beta_5 \text{Healthstatus}_{it} + \beta_6 \text{RHH}_{it} + \beta_7 \text{Child}_{it} + \beta_8 \text{Urban}_{it} + \beta_9 \text{Female} + \mu_{it} \quad (4)$$

A summary of the scale of measurement and definition of the variables included in the equation is presented in Table A at the appendix¹. The inclusion of each of these variables is based on theoretical justification and the findings of empirical studies. In equation 4, we expect that hours of unpaid work should be positively associated with wage, remittance, age, living in the urban area, being single, being in informal relationship, and being the head of the household. However, we expect that those who are married, the number of children under five years of age that one has, and being a female should have positive relationship with hours of unpaid work. On the other hand, hours of paid work should have positive association with wage, age, and urban residence. We expect a negative association with non-wage income (remittance), the square of age, the number of children under five years of age, poor health status, being single or in informal relationship. The sign for the relationship to the household head remains uncertain since the decision to participate in the labour market participation by children, grandchildren, other relatives and servants is dependent on a number of factors within the household. Some of these factors are the age of the person, and the number of dependents (children, elderly, and the sick).

Instrumental variables (IV) testing

The available literature suggests that there are several variables that can be used as instruments to moderate the relationship between wage and time allocation. Among such variables used in the literature are: education of the respondent, union status or membership, region of residence,

¹ *Hourspaid*, *Hoursunpaid*, *lnwage*, *lnremit*, *Age* and *Agesq* represent hours of paid and unpaid work, natural log of wage, natural log of remittance, age and square of age of the respondent. Respectively, *Mstatus*, *healthstatus*, *RHH*, *Child*, *Urban* and *female* represent marital status, health status, relationship to household head, geographical location and gender of the respondent.

industry or sector of employment (Sedigh et al., 2016). Other studies have used pre-tax wage, the square of pre-tax wage, capital income and the square of capital income as valid instruments (Daunfeldt & Hellström, 2007). We explored the appropriateness of some of these variables available in the data and found the education of the respondent, union membership and sector of employment to be good instruments for wage.

We used the minimum distance approach to determine the validity and strength of the instruments. The advantage of the minimum distance approach compared to the other approaches is that it has the ability to produce correct size of the coefficient of the endogenous variable regardless of whether the identification condition holds or otherwise. It also allows for the computation of confidence intervals that have correct coverage probability irrespective of the strength or weaknesses of the instrument (Finlay & Magnusson, 2009). This confidence interval serves as additional test to determine the appropriateness of the instrument. There are two main conditions that a good instrument must satisfy: 1) The instrumental variable must correlate with the endogenous variable; 2) the values of the instrumental variables and exogenous variables are unrelated with the values of the error term in the structural model. This makes the predicted values for the endogenous variable free of selection bias or unobserved characteristics, assuming a correctly specified model (Miluka et al., 2010).

Sample design and data

This study relies on a pooled data from the last three rounds (GLSS4, GLSS5 and GLSS6) of the Ghana Living Standard survey. The sample design for the GLSS4 was based on the survey list of the 1984 population census Enumeration Areas (EAs) with information on population and household as the sampling frame. The primary sampling units were the 1984 EAs while the secondary units were the households in the EAs. In designing the sample, the Ghana Statistical Service employed stratification technique by using geographical factors, ecological zones and location of residence as the main controls. The EAs were first stratified according to the three ecological zones namely; Coastal, Forest and Savannah. Within each zone further stratification was done based on the size of the locality into rural or urban (Ghana Statistical Service, 2000).

According to the Ghana Statistical Service, two-stage sampling technique was used for the sample selection. The first stage involved the selection of 300 EAs using systematic sampling with probability proportional to size method (PPS) where the size measure was the 1984 number of households in the EA. The process involved ordering of the list of EAs according to their sizes and strata. The size column was then cumulated, and with a random start and a fixed interval, the sample EAs were selected. The EAs that had grown in size over time were further divided into

approximately equal parts with each segment constituting about 200 households. Only one segment was then randomly selected for listing of the households. At the second stage of the sampling process, a fixed number of 20 households were systematically selected from each selected EA to give a total of 6,000 households. The Ghana Statistical Service selected an additional five households as reserve to replace missing households. This was followed by the selection of an equal number of households from each EA in order to reflect the labour force focus of the survey (Ghana Statistical Service, 2000). In addition, five households per EA were selected as replacement samples. The overall sample size therefore came to 8,700 households nationwide. However, 8,687 households were actually interviewed at end of the survey.

The Ghana Statistical Service has not changed the process of sampling over the years and the same sampling design has been used with some revisions. For instance, during the GLSS5, Ghana Statistical Service defined the EAs as the primary sampling units (PSUs), while the households within each EA constituted the secondary sampling units (SSUs). The EAs, which were considered as the first stage of sampling were increased from 300 during the GLSS4 to 550 during the GLSS5 and a fixed number of 15 households per EA. The EAs were stratified into the ten administrative regions and within each region, they were further sub-divided according to their rural and urban areas of location. They were also classified according to ecological zones including Accra (GAMA) to arrive at three ecological zones, namely 1) Coastal, 2) Forest, and 3) Northern Savannah, and for Accra (Ghana Statistical Service, 2008).

Although the same two stage sampling methodology used in the previous surveys was used during the GLSS6, the number of primary sampling units (PSUs) and households were increased from 580 and 8,700 to 1,200 and 18,000 respectively which represented an increase of about 107 percent over the GLSS5 figures (Ghana Statistical Service, 2014). The first stage of the sampling process involved the selection of 1,200 enumeration areas (EAs) from the PSUs. The PSUs were allocated into the 10 regions using probability proportional to population size (PPS). The EAs were further classified into urban and rural localities of residence. The second stage involved the listing of households in the selected PSUs to constitute the secondary sampling units (SSUs) where 15 households from each PSU were selected systematically. This resulted in a total sample size came of 18,000 households nationwide (Ghana Statistical Service, 2014).

The data used for the analyses were extracted for the time use models of the GLSS4, GLSS5 and GLSS6. As indicated in Table 1, all the hours spent on paid employment in the last seven days preceding the Ghana Living Standard Survey (GLSS) were aggregated as hours of paid work. In the GLSS 5 and 6, there were only two economic activities that were captured.

These were primary or main occupations and secondary occupations. All extreme values reported in the data sets were addressed using the winsorising method to set the top 1 percent and bottom one percent of the weighted time use variables to the value of the 1st and 99th percentile. Similar to the process of computing the paid hours of work, the variable unpaid hours of work were computed by aggregating all the unpaid household activities on which the respondents spent their time in the last seven days preceding the survey.

Since the study seeks to assess the gender dynamics in relation to time use, separate aggregated variables were created for males and females within the same household. Unlike other studies such as Daunfeldt and Hellström (2007) where the analysis were restricted to only couples, all male and female households members who are fifteen years and above are considered in order to account for the heterogeneities among household members. We stress that following the contents of the data at hand, we designated paid work by market labour and unpaid work by household labour. We applied the same winsorising method to address all outliers in the unpaid time use data before computing all the indicators.

It must be made clear that both nominal and real wages were used in the analysis. The nominal wage was computed as the sum of the nominal income earned from main and secondary occupations. In July 2007, the Bank of Ghana (BoG) embarked on re-denomination of Ghana's currency (Cedi) which led to the replacement of the old Cedi (¢) with the new Ghana Cedi (GH¢). Citing several reasons such as years of continuous decline in the value of the currency, high levels of inflation, and portability of the currency the Bank of Ghana reduced the number of zeros by four such that ten thousand Cedis would be equivalent to one Ghana Cedi. Since the dataset used in the analysis span across the regimes of both the old and new currencies an adjustment was made to the data on wage in the GLSS 4 and GLSS5 which were conducted before the re-denomination. Wage was divided by ten thousand (1000) in order to standardize the data.

Also, wage had been captured in hourly, daily, weekly, monthly, quarterly and yearly units (Ghana Statistical Service, 2014). However, to ensure consistency between the time use and, wages, all these units were converted into weeks. For policy purposes, the weekly wages were further computed on hourly bases by dividing the total wage receipts in a given period by the number of hours worked (Ghana Statistical Service, 2014). This means that the results are interpreted as weekly change in hours of work due to change in hourly wage. The surveys collected information on only nominal earnings of the respondents from their main and secondary occupations. Nonetheless, this study goes further to adjust for inflation by computing the real wage since most economic decisions are made based on relative (real) wages. In computing the

real wage, we divide the nominal wage (the observed wage in the market) by the consumer price index (CPI), where the CPI is also expressed as a ratio and not a percent.

Table: Observations for activities performed by individuals 15 years and above

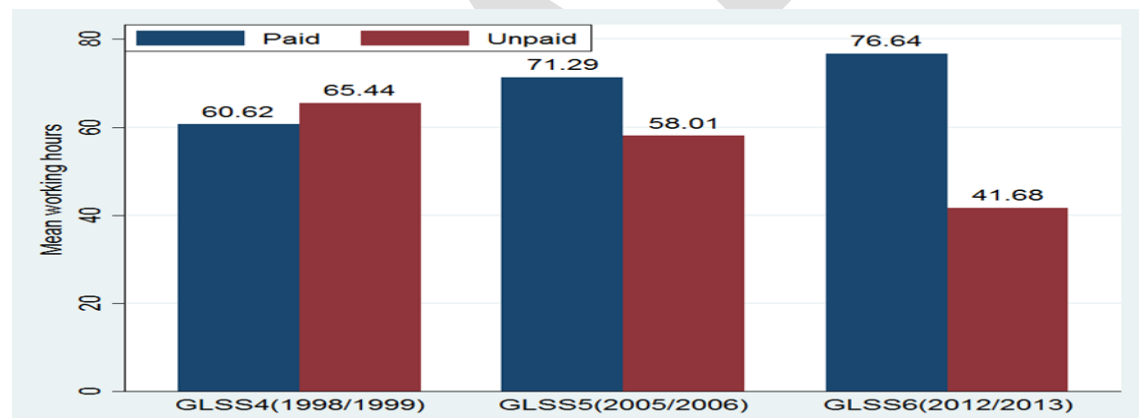
Variable (hours)		GLSS4 (1998/99)	GLSS5 (2005/06)	GLSS6 2012/3
No	Unpaid work	Obs.	Obs.	Obs.
1	Collecting firewood	4,137	21,249	42,517
2	Fetching water	6,259	21,107	42,519
3	Ironing	3,819	21,296	42,518
4	Taking care of children	4,879	21,184	42,486
5	Cooking	7,345	21,141	42,518
6	Running errands	5,196	21,228	42,518
7	Shopping	5,844	21,251	42,519
8	Washing	5,524	-----	-----
9	Washing vehicle	134	-----	-----
10	Washing dishes and pots	-----	21,359	42,517
11	Washing clothes	-----	21,346	42,521
12	Sweeping	7,296	-----	-----
13	Disposing garbage	3,886	-----	-----
14	Cleaning	-----	21,223	42,514
15	Others	7,928	21,216	-----
16	Taking care of elderly	-----	21,230	42,495
17	Taking care of the sick	-----	21,339	42,496
18	Helping children with school work	-----	-----	42,480
19	Collecting food from garden	-----	-----	42,494
Paid work				
1	Primary work	2,595	14,593	30,973
2	Secondary work	2,794	2,537	4,857
3	Third work	226	-----	-----
4	Fourth work	19	-----	-----

Source: Prepared by the authors using Ghana Living Standard Survey (GLSS)

Results and discussion

This section begins with an overview of the distribution (in Figures 1 to 10) of the aggregated time use variables and wage across gender, geographical location, education, marital status and relationship of the respondent to the household head. It must be made clear that in some instances the hourly wages reported in this study may be higher than the ones reported in the Ghana Living Standard Survey (GLSS) reports because this study considered both primary and secondary occupations of the respondent while the Ghana Statistical Service focused on wages from main or primary occupations only. However, in terms of the paid working hours, respondents who indicated that they did the primary work at the same time as the secondary jobs were countered ones as having done primary jobs. This is because, the worker would be in one of the work places (either the primary occupation or secondary occupation) at a time and cannot be at both work places at the same time.

Figure 1: Paid and unpaid working hours by year of survey (1998-2013)



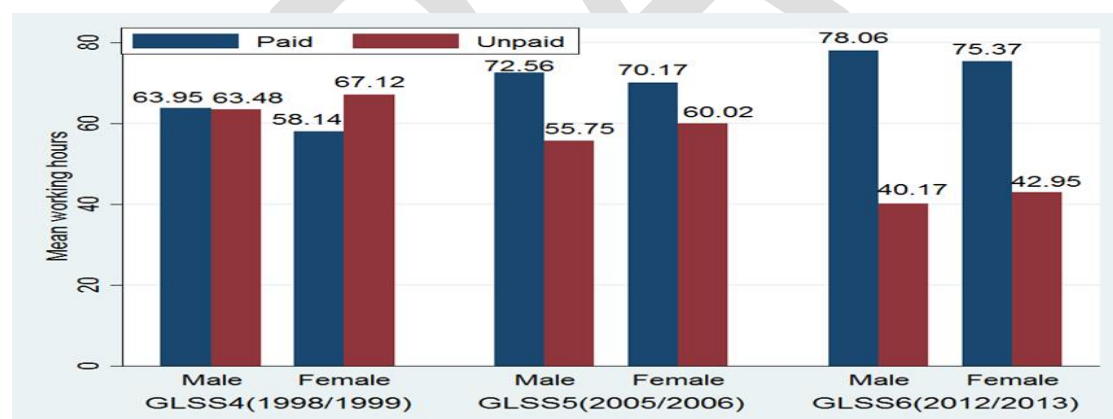
Source: Prepared by the authors using Ghana Living Standard Survey (GLSS) data sets.

It can be observed from Figure 1 that during the 1998/1999 survey period, unpaid working hours were more than paid working hours. However, the opposite is observed in the 2012/2013 survey period. Within the one and half decade (1998-2013), time spent on unpaid work activities by individuals in Ghana has reduced while paid working hours have increased considerably. The average unpaid working hours have reduced by 37 percent from approximately 67 hours in 1998/1999 survey period to 42 hours per week during the 2012/2013 survey period. However, paid working hours have increased by 26 percent from 61 hours to 77 hours a week within the same periods of the surveys. Consistently, higher reductions in the number of unpaid working hours are offset by lower increases in paid working hours and vice versa. For instance, when unpaid working hours reduced by 9 hours between the 1998/1999 and 2005/2006 survey periods,

paid working hours increased by 10 hours. When unpaid working hours reduced by 16 hours between the 2005/2006 and 2012/2013 survey periods, increase in paid working hours was just 6 hours. This should have some implications for leisure and other self-care activities

From gender perspective, unpaid working hours have reduced from as high as 68 hours per week among women in the 2008/2009 survey period to about 43 hours a week in the 2012/2013 survey period. This translates to around a 38 percent reduction in unpaid hours spent by females on household activities. On the contrary, an approximately 39 percent reduction is observed among males within the same period. This means that females continue to be at disadvantaged as they spend about 3 hours (1%) more than males on unpaid work. In essence, there has been a general reduction in unpaid working hours but there exist a gap between males and females. Also, paid working hours have generally increased. However, the percentage increase (29%) among females has been higher than the percentage increase (22%) among males. Regardless of the reduction in the gap between the average paid working hours of male and female from 6 hours in the 2008/2009 survey period to 3 hours in the 2012/2013 survey period, females still spend more total (paid and unpaid) working hours than males in Ghanaian households.

Figure 2: Hours spent on paid and unpaid work by gender (1998-2013)

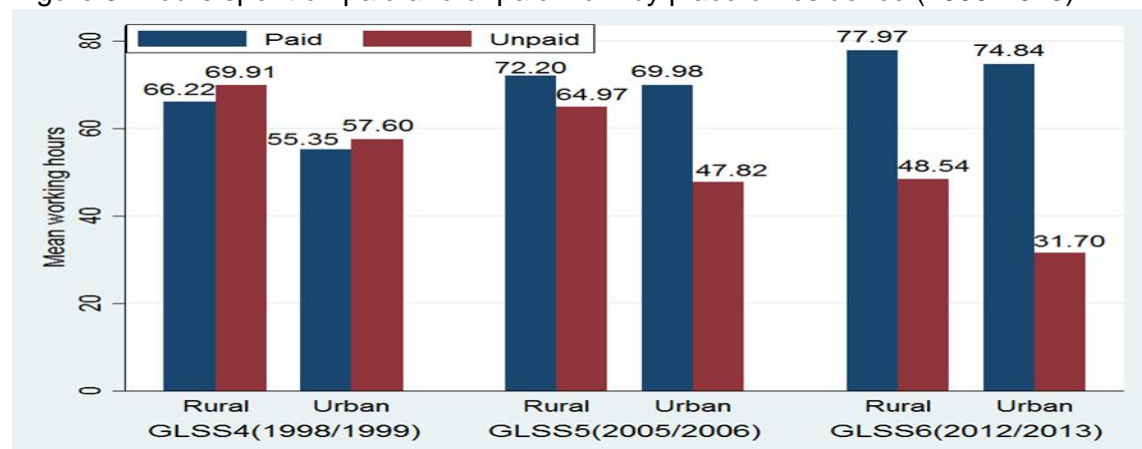


Source: Prepared by the authors using Ghana Living Standard Survey (GLSS) data sets.

Across geographical location, similar pattern of reduced unpaid working hours and increased paid working hours are observed. Nonetheless, Figure 3 depicts that while the average hours spent on unpaid work has reduced by 46 percent among individuals in the urban areas the reduction is 31 percent among respondents in the rural areas. On the other hand, the increase in average paid working hours for urban residents (36%) is twice the 18 percent increase among rural residents. This has contributed to a reduction in the gap of paid working hours between rural

and urban residents from 11 hours in the 1998/1999 survey period to approximately 3 hours in the 2012/2013 survey period. However, the gap between rural and urban residents of unpaid working hours has increased from 15 hours in the 1998/1999 period to 17 hours in the 2012/2013 period.

Figure 3: Hours spent on paid and unpaid work by place of residence (1998-2013)



Source: Prepared by the authors using Ghana Living Standard Survey (GLSS) data sets.

Correlates of unpaid working hours across gender and place of residence

We begin the presentation of the results with post estimation analysis. As presented in Tables 1, 2, 3 and 4, the Wald tests show that the exogeneity condition of the instrument is satisfied since the p-values are significant at the conventional levels (10%, 5% and 1%) for all the models. The condition for rejecting the Wald test of the exogeneity of the instrumented variables is that if the test statistic is not significant, there is not sufficient information in the sample to reject the null hypothesis of no endogeneity. Also, the null hypotheses for the weak-instrument (reported in Tables, structural parameters, and over identification restriction tests are confidently rejected in favour of the alternative since the p-values for all these tests are insignificant.

Tables 1 and 2 contain the results on unpaid working hours across gender and place of residence of respondent. From Table 1, it can be observed that although wage has negative effects on unpaid working hours of males and females it appears to be significant for only females. At a 5 percent level of significance, the unpaid working hours of females reduces by 0.715 when nominal wage increase by 1 percent and 0.810 when real wage increases by the same percentage, *ceteris paribus*. The insignificance of wage effect on male's time allocation to unpaid work in the household does not violate the general expectation since the socio-cultural roles of males in most developing countries like Ghana do not compel them to perform more domestic

activities as compared with their female counterparts. Instead, males are seen as breadwinners. As such, they are generally expected to spend more time on income generating activities to sustain the household.

While the negative response of female time allocation to unpaid household work corroborates the findings of Devereux (2004), Gupta and Ash (2008), and Kimmel and Connelly (2007) it is in contrast with those of Argyrous and Rahman (2014) who observed that mothers perform a large share of child care irrespective their earnings. The observed responsiveness of unpaid working hours of females to an increase in wage can be interpreted from different perspectives. In the context of the economic/bargaining theory it can be argued that an increase in the educational attainment and wage of women strengthen their bargaining power and reduce their comparative advantage in unpaid work (relative to paid work). This enables them to reallocate more time to paid (Sayer, 2005). However, in the context of developing countries like Ghana where labour market rigidities and socio-cultural norms shape women's time allocation, it remains unclear whether they will have the space to reallocate such reduced hours to either paid work in the labour market or leisure.

The negative effect of wage on unpaid working hours is also observed when we perform the regression analysis on sub-samples of rural and urban residence. Nonetheless, the effect is relatively higher for rural residents than their urban counterparts. Holding all other factors constant, the average unpaid working hours of rural residents reduce by a little over an hour when wage (both real and nominal) increases by 1 percent. As observed in the descriptive analysis, rural residents by nature of their economic and social settings spend more time on both paid and unpaid work. However, this finding provides enough basis for considering the spatial differences in the wage effect of intra-household time allocation. We can infer from these results that rural residents are not merely interested in spending more time on both paid and unpaid work. Rather, if they have the means to increase their earnings, they will equally be able to pay for the services of others to perform some of their unpaid activities in the household to enable them reallocate their free time to either leisure or self-care.

Table 1: Estimates of unpaid hours of work across gender

Dependent variable (Unpaid hours)	Nominal wage			Real wage		
	Male	Female	All	Male	Female	All
Ln wage	-0.394 (0.254)	-1.013*** (0.345)	-0.654*** (0.205)	-0.629*** (0.232)	-1.542*** (0.308)	-0.980*** (0.185)
Age	0.364*** (0.057)	0.468*** (0.054)	0.425*** (0.039)	0.375*** (0.057)	0.477*** (0.054)	0.434*** (0.039)
Age square	-0.004***	-0.006***	-0.005***	-0.004***	-0.006***	-0.005***

	(0.001)	(0.001)	(0.0004)	(0.001)	(0.001)	(0.0004)
Informal	-7.452***	-4.580***	-6.471***	-7.345***	-4.561***	-6.448***
	(0.576)	(0.517)	(0.381)	(0.564)	(0.516)	(0.378)
Single	-16.92***	-3.139***	-10.74***	-16.67***	-3.117***	-10.73***
	(0.447)	(0.551)	(0.332)	(0.437)	(0.548)	(0.327)
Poor health	-0.215	-0.118	-0.257	-0.264	-0.228	-0.327
	(0.433)	(0.384)	(0.288)	(0.427)	(0.384)	(0.286)
Spouse	3.166**	6.467***	2.350***	3.281**	6.996***	2.640***
	(1.356)	(0.495)	(0.338)	(1.347)	(0.496)	(0.330)
Child/Grand child	25.42***	16.26***	19.76***	25.50***	16.55***	19.98***
	(0.565)	(0.521)	(0.389)	(0.540)	(0.517)	(0.378)
Other relative	24.17***	16.24***	18.66***	24.47***	17.01***	19.22***
	(0.915)	(0.820)	(0.612)	(0.902)	(0.836)	(0.611)
Servant/Adopted	23.10***	18.28***	19.77***	23.39***	20.00***	20.64***
	(1.744)	(1.855)	(1.272)	(1.743)	(1.906)	(1.286)
Children under5	4.085***	3.327***	3.742***	4.094***	3.319***	3.744***
	(0.125)	(0.112)	(0.083)	(0.124)	(0.112)	(0.083)
Urban	-8.389***	-8.632***	-8.566***	-8.148***	-7.927***	-8.141***
	(0.319)	(0.309)	(0.223)	(0.346)	(0.356)	(0.248)
Ln remittance	-0.082	0.108*	-0.018	-0.081	0.077	-0.0306
	(0.059)	(0.057)	(0.041)	(0.058)	(0.058)	(0.041)
Year2005	-7.012***	-7.838***	-7.472***	-7.089***	-7.952***	-7.572***
	(0.656)	(0.586)	(0.437)	(0.645)	(0.581)	(0.433)
Year2012	-18.77***	-21.98***	-20.25***	-18.46***	-20.64***	-19.56***
	(0.588)	(0.518)	(0.390)	(0.616)	(0.598)	(0.425)
Female	-----	-----	1.390***	-----	-----	1.368***
	-----	-----	(0.252)	-----	-----	(0.248)
Observations	29,373	31,009	60,382	30,014	31,194	61,208
Left-censored	418	199	617	439	200	639
Wald (exogeneity)	2.79**	3.65**	4.46**	7.14**	16.25***	10.37***

Standard errors in parentheses², *** p<0.01, ** p<0.05, * p<0.1

Another important point worthy of notice is that the type of wage used for the analysis matters. It is obvious from the results that real wage has higher effects on hours of unpaid work than the nominal wage. This corroborates the general assertion that time allocation decisions of Ghanaians and for that all rational economic agents are largely influenced by relative value of wage and not only the nominal value. The comparison of the relative effects of nominal and real wages on the time allocation across gender and space remain one of the contributions of this study since most of the existing studies have not paid attention to it. Large proportion of the extant studies have mainly focused on relative effects of the wages of couples on each other's time

² Marital status is categorised into married, informal and single with married as the base category. Similarly, relationship to the household head is captured under head, spouse, child/grand-child, other relative and servant/adopted and the head is considered as the reference category. In terms of the year dummies for the survey periods, 1998/1999 is used as the reference category.

allocation (Bloemen & Stancanelli, 2014a; Craig, 2006; Daunfeldt & Hellström, 2007), while others have only concentrated on nominal wage. However, in developing countries like Ghana where price instability is rife and inflation is a common phenomenon, we find it imperative to account for inflation in order to compare the effects of real wage and nominal wages on intra-household time allocation to guide policy makers on wage-related policies.

Aside wage, other control variables were included in the models to assess their effects on hours of work in the household and on the labour market. The literature suggests that non-wage³ income plays important role in intra-household time allocation (Alderman & Chishti, 1991; Ilahi & Grimard, 2000; Ilahi & Jafarey, 1999). As a result, remittances were used as a proxy for non-wage income to assess its effect on male and female time allocation in this study. It can be seen from Table 1 that although remittance reduces both male and female unpaid working hours, it appears to be insignificant for females but significant for males. Regardless of the type of wage used, Table 2 shows that remittance remains insignificant for both rural and urban residents. The observed negative effects of wage support the earlier studies that an increase in unearned income reduces the supply of labour of individuals and work at home

An inference that can be drawn from this finding is that males, who are by nature known to spend less time on household production, spend their non-wage incomes on hiring others to perform those household activities. Females may equally reduce their unpaid hours of work. However, given that they are societally known to be responsible for such activities in the household, the increase in their non-wage income such as remittance may not be enough to enable them avoid such responsibilities entirely. The insignificance of remittance in this study supports the findings of Ilahi (2000) who elaborates on the appropriateness of remittances, transfer income and other variables used as proxies for non-wage income to explain time use in the household. The author contends that in the context of time allocation such variables may sometimes play two confounding roles. They may be indeed a proxy of wealth and non-wage income but they are also part of the production function of the household making it unclear what exactly they measure.

³ Several variables have been used as proxies for non-wage income in the literature. These include remittance, value of home assets, and value of productive assets (Ilahi, 2000), value of the family farm and value of home (Skoufias, 1993).

Table 2: Estimates of unpaid hours of work by geographical location

Dependent variable (Unpaid hours	Nominal wage			Real wage		
	Rural	Urbane	All	Rural	Urban	All
Ln wage	-1.233*** (0.392)	-0.336 (0.235)	-0.654*** (0.205)	-1.483*** (0.364)	-0.750*** (0.208)	-0.980*** (0.185)
Age	0.407*** (0.054)	0.432*** (0.0540)	0.425*** (0.039)	0.411*** (0.054)	0.450*** (0.0532)	0.434*** (0.039)
Age square	-0.005*** (0.001)	-0.004*** (0.001)	-0.005*** (0.0004)	-0.005*** (0.001)	-0.004*** (0.001)	-0.005*** (0.0004)
Informal	-7.224*** (0.524)	-5.113*** (0.542)	-6.471*** (0.381)	-7.217*** (0.522)	-5.032*** (0.533)	-6.448*** (0.378)
Single	-10.92*** (0.492)	-10.08*** (0.435)	-10.74*** (0.332)	-10.93*** (0.491)	-10.02*** (0.423)	-10.73*** (0.327)
Poor health	-0.628 (0.415)	0.264 (0.386)	-0.257 (0.288)	-0.645 (0.414)	0.158 (0.382)	-0.327 (0.286)
Spouse	2.950*** (0.496)	1.693*** (0.446)	2.350*** (0.338)	3.159*** (0.489)	2.030*** (0.428)	2.640*** (0.330)
Child/Grand child	20.52*** (0.585)	18.62*** (0.501)	19.76*** (0.389)	20.67*** (0.576)	18.88*** (0.485)	19.98*** (0.378)
Other relative	20.21*** (0.967)	17.03*** (0.752)	18.66*** (0.612)	20.59*** (0.965)	17.72*** (0.762)	19.22*** (0.611)
Servant/Adopted	22.02*** (2.116)	17.72*** (1.500)	19.77*** (1.272)	22.61*** (2.146)	18.72*** (1.528)	20.64*** (1.286)
Children under5	3.612*** (0.104)	4.079*** (0.140)	3.742*** (0.083)	3.617*** (0.104)	4.056*** (0.138)	3.744*** (0.083)
Ln remittance	-0.037 (0.065)	-0.0001 (0.050)	-0.018 (0.041)	-0.0278 (0.065)	-0.020 (0.050)	-0.031 (0.041)
Female	0.787** (0.374)	1.981*** (0.326)	1.390*** (0.252)	0.823** (0.371)	1.877*** (0.319)	1.368*** (0.248)
Year2005	-7.056*** (0.590)	-8.163*** (0.658)	-7.472*** (0.437)	-7.137*** (0.587)	-8.169*** (0.645)	-7.572*** (0.433)
Year2012	-21.19*** (0.525)	-19.32*** (0.587)	-20.25*** (0.390)	-20.59*** (0.560)	-18.46*** (0.661)	-19.56*** (0.425)
Urban	----- -----	----- -----	-8.566*** (0.223)	----- -----	----- -----	-8.141*** (0.248)
Observations	34,251	26,131	60,382	34,398	26,810	61,208
Left-censored	281	336	617	283	356	639
Wald (exogeneity)	3.72**	4.78***	3.65**	3.41**	4.24***	3.29**

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

This subsection has shown that wage has differential effects on the unpaid working hours of males and female, as well as rural and urban residents. Even though it reduces the hours of unpaid work for both sexes, the effect is significantly higher for females and rural residents than males and urban residents. It is also apparent from the yearly dummies that unpaid working hours have reduced considerably from 1998 to 2012. However, what remains unknown from the analysis is whether there has been some reallocation of such reduced hours into hours of paid

work, leisure or self-care. The next subsection presents the correlates of paid working hours with much focus on wage.

In addition to remittance, we include age in the analysis and it appears to be an important factor particularly for females even though the magnitude of the coefficient is small. In Table 1, age has negative and significant effect on females' hours of unpaid work but it is insignificant for male. Thus females tend to reduce their time spent on household work as they grow old and possibly delegate those responsibilities to children and other younger household members. Age appears to have insignificant effect on males' time allocation to unpaid work partly because in most traditional homes in Ghana where element of patriarchy exists, male adults perform virtually no role and they are seen as the source of authority.

Across geographical location, Table 2 depicts a negative association between age and unpaid hours of work for rural residents but positive effect for urban residents. This observation gives a clear sense of the rural-urban differences in social norms that explain time allocation to household activities. The adoption of western custom of relative equality among members of urban household may contribute to reduce the propensity of complete delegation of household responsibilities from adult to children and other less economically empowered members. Some studies (Sedigh et al., 2016) have observed a nonlinear relationship between age and unpaid hours of work which motivated this study to explore the presence or otherwise of non-linear relationship between age and unpaid work. However, no evidence of such relationship was observed.

In typical traditional homes in developing countries, one's relationship to the household head largely determines his/her role in the household. Also, the relative resources theorists argue that the allocation of housework reflects power relations between men and women, children and adults (Bianchi, Milkie, Sayer, & Robinson, 2000). The end results of this power relation are that unpaid household work becomes the responsibility of the economically dependent such as women and children. In view of this a variable that captures the relationship of the respondent to the household head was included in the analysis. With the head of the household as the reference category, the results in Table 1 shows that in deed there is an element of delegation of responsibilities from household heads and spouse to children, grandchildren, and other household members who may be considered as the economically dependent. Compared to the head of the household, children/grandchildren, other relatives and servants/adopted children tend to spend more hours on unpaid work than even the spouse. Children/grand-children, other relatives and servants who are males and those in the rural areas (see Table 2) spend more time on unpaid work than their female and urban counterparts.

Not only does one's status in the household shapes his/her time allocation decision but his/her marital status has also been found in the literature to be an important factor. Women's time allocation to unpaid work have been found to increase upon marriage (Sayer, Bianchi, & Robinson, 2004). In this study, three categories of marital status (married, informal relationship and single) were included in the analysis. The category single is made up of those who have been divorced, widowed, separated or never married. Since married people especially, those who have children are expected to play multiple roles in the household, they were considered as the base category. From Tables 1 and 2, the results depict that compared to those who are married, respondents who are single and those who are in informal relationship spend less time on unpaid work. The extents of the effects are higher for males than females, and higher for single people than those who are in informal relationship. Across geographical location (see Table 2), the effect is high for the single and those who are in informal relationship in the rural areas than those who are in the urban areas. As already indicated, marriage comes with additional responsibilities that are not only limited to the immediate family but the extended family of the couples. In some instances, particularly in the rural areas, daughters-in-law are responsible for cooking for the entire family and taking care of their fathers-in-law who are either bedridden or sick. These additional responsibilities contribute to increased unpaid working hours among married women.

Another control variable found to have significantly positive effect on unpaid hours of work is the number of children under the age of five. What appears to be a bit striking is that contrary to majority of the findings in the literature, we find the effect of additional child to be higher for males than females and for urban residents than rural residents. Holding other factors constant, having an additional child under five years of age is associated with an increase in unpaid working hours by a little over 4 hours for males and 3 hours for females per week. Respectively, additional child increases the unpaid working hours of urban and rural residents by virtually the same number of hours as males and females. The higher effect of additional child on unpaid hours of male appears to be quite surprising since child care is known to be predominantly women's responsibility.

When gender and geographical location are treated as variables rather than sub-samples in the models for the unpaid working hours, we observe (in Table 1) that being in the urban area respectively reduces male's and female's weekly time allocation to unpaid work by about 8.4 and 8.5 hours than being in the rural area. At 1 percent level of significance, both sex in the urban area work a little over 8 hours less than their counterparts in the rural area. This also confirms the dominance of rural residents in both paid and unpaid working hours in the descriptive analysis. Thus males and females in the urban areas spend about 8 hours less than their counterparts in

the rural areas on unpaid household activities. In the total sample, females spend averagely 1.5 hours on unpaid work compared to males. In Table 2, females in rural areas spend 0.95 hours on unpaid than their male counterparts. Similarly, those in the urban areas spend 2.1 hours on unpaid work than males. This means that while the negative effect of urban residence on hours of unpaid work is high for females than males, the gender difference in hours of unpaid is relatively higher among urban residence than rural residence.

Irrespective of gender or geographical location, health is an important factor that determines the number of hours that one can spend on work in the household and the labour market. The literature suggest that poor health reduces hours of paid and unpaid work (Bianchi et al., 2000; Klevmarken, 2005). It has been found to have a strong link with sleep duration and other personal care (Sedigh et al., 2016). In this study, a binary variable that measures the health status of respondents during the week before the survey shows that experience of poor health reduces the hours of unpaid work across gender and place of residence but it appears to be insignificant in all the models. This finding does not mean that poor health has insignificant effect on specific household activities. Instead, it may have higher effect on some activities that require more energy than those that require less energy.

As a general approach to modelling and testing for differences in intercept term or slope coefficients between the periods of the three surveys, we include dummies for the year 2005 and 2012 with 1998 as the reference category. The essence of keeping 1998 as the base category is to avoid a tendency of dummy-variable trap while allowing the intercept to have different values in each period of the survey. The coefficients of the year dummies confirm the downward trend of unpaid working hours since 1998. From 1998 to 2005, hours of unpaid work have reduced by at least 7 hours a week for both sexes and among rural and urban residents. Equally, from 1998 to 2012, hours of unpaid work have reduced by not less than 18 hours a week for both sexes and among rural residence.

Correlates of paid working hours across gender and place of residence

The point estimates of the gross effect of wage on hours of work has remained contentious and a priori ambiguous even though the dominant findings suggest a negative effect. It can have either income or substitution effect depending on several socioeconomic factors such as gender, income level of the individual and the unit of measurement (hourly, daily, weekly, annually) of work (Borjas, 1980). In this study, we contend that by the virtue of differences in geographical location, socioeconomic status and social norms, increase in wage may have differential effects on paid hours of work for males and females as well as rural and urban residents. As a result, we run

separate regressions for males and females, and rural and urban residents. As depicted in Table 3, wage has positive effect on paid hours of work of males but negative effect for females. Holding all other factors constant, increase in the nominal wage by 1 percent increases the paid working hours of males by 1.472 hours but reduces those of females by 0.962 per week. Similarly, increase in the real wage of male by the same percentage increases their paid working hours by 1.076 hours but reduces those of females by 0.774 hours.

Both the negative effect of wage for females and the positive effect for males find support in the theoretical and empirical literature. In the context of the neoclassical proposition, it can be inferred that wage has an income effect on females' time allocation and substitution effect on males' time allocation to paid work in Ghana. However, it is important to put across a caveat that in developing countries like Ghana, theoretical interpretation of results of this nature has to be done with consideration of the norms and country-specific features which may have confounding effects on women's time allocation to both paid and unpaid work. For instance, labour market rigidities, gender segregation and other unfavourable working conditions that usually work to the disadvantage of women may play important role in determining the extent to which women may allocate more hours to paid work even if wage increases.

Empirically, the negative effect of wage on females' hours of paid work corroborates similar observation made by Parera-Nicolau and Mumford (2005) who found a negative relationship between mothers' labour supply and their own wages in the United Kingdom. Our results are however, in contrast with the findings of Devereux (2004) and Kalenkoski, Ribar, and Stratton (2009) who found labour supply among married women to be modestly positively related to changes in their own wages. What is important to be noted is that while the data used in this do not disentangle the effect of wage on weekdays from weekends, in the case of Kalenkoski et al. (2009), they disaggregated their analysis into weekdays and weekends and the negative relationship was observed for only the sub-sample on weekdays.

Across geographical location of the respondent, the results in Table 4 evinces that although wage has positive effects on paid working hours of both rural and urban residents, the effect is higher for rural residents than urban residents. At a 1 percent level of significance, increase in nominal wage by 1 percent increases the paid hours of work of rural and urban residents by 1.352 and 0.935 hours respectively. In the same vein, increase in the real wage by 1 percent induces an increase in the hours of paid work for respondents in the rural and urban areas by 0.992 and 0.435. It may be argued that given the economic opportunities in the urban areas, increase in wages should have higher effects on the paid hours of work of urban residents than their rural counterparts. However, the Ghana Statistical Service report on the sixth round of

the Ghana Living Standard Survey provides two bases upon which the higher wage effect on rural residents is justifiable: 1) The report indicates that out of the 77.1 percent of the population 15 years and above who are economically active, those in the rural areas are more likely than those in the urban areas to be economically active; 2) It also shows that about four out of every five persons in rural areas is employed (81.7 percent) compared to 69.9 percent in urban areas (Ghana Statistical Service, 2014). These two factors may strongly contribute to the reason why the wage effect of hours of paid is higher for rural residents than urban residents.

Similar to the results across gender, the magnitude of the effect of nominal wage across geographical location is higher than the real wage. The positive effect across geographical location point to the fact that increases in wage has substitution effects on hours of paid work of both rural and urban residents. At the national level, the substitution effect outweighs the income effect, rendering the total effect substitutive. It is evident from the results that real wage has higher effects on hours of unpaid work than nominal wage while nominal wage has higher effect on paid work than real wage. The latter suggests an element of money illusion among Ghanaians in the labour market.

Table 3: Estimates of paid hours of work across gender

Dependent variable (Paid hours)	Nominal wage			Real wage		
	Male	Female	All	Male	Female	All
Ln wage	1.472*** (0.363)	-0.962** (0.458)	0.640** (0.282)	1.076*** (0.340)	-0.774* (0.408)	0.435* (0.258)
Age	0.970*** (0.0779)	1.070*** (0.0657)	1.005*** (0.0499)	0.995*** (0.0777)	1.071*** (0.066)	1.017*** (0.0498)
Age square	-0.011*** (0.00081)	-0.012*** (0.00072)	-0.011*** (0.00053)	-0.011*** (0.00081)	-0.012*** (0.00071)	-0.011*** (0.00053)
Informal	-1.637 (0.823)	0.378 (0.676)	-1.587 (0.527)	-1.451 (0.814)	0.358 (0.675)	-1.557 (0.525)
Single	-17.81*** (0.664)	-0.0916 (0.684)	-11.09*** (0.438)	-17.73*** (0.654)	-0.125 (0.680)	-11.15*** (0.435)
Poor health	-4.177*** (0.602)	-2.703*** (0.505)	-3.485*** (0.388)	-4.189*** (0.598)	-2.717*** (0.504)	-3.503*** (0.387)
Spouse	3.850** (1.723)	16.59*** (0.618)	8.595*** (0.459)	3.826** (1.723)	16.67*** (0.615)	8.625*** (0.458)
Child/Grand child	26.41*** (0.819)	20.79*** (0.625)	22.21*** (0.512)	26.31*** (0.808)	20.87*** (0.622)	22.24*** (0.507)
Other relative	26.23*** (1.459)	21.35*** (1.169)	21.95*** (0.927)	26.22*** (1.449)	21.38*** (1.167)	22.02*** (0.925)
Servant/Adopted	28.16*** (2.969)	29.02*** (2.912)	27.62*** (2.100)	28.50*** (2.969)	29.07*** (2.911)	27.79*** (2.100)

Child under 5	-1.525 (0.137)	-0.973 (0.118)	-1.314 (0.0897)	-1.520 (0.137)	-0.983 (0.118)	-1.318 (0.0895)
Urban	-0.586 (0.442)	0.757 (0.390)	0.0886 (0.293)	-0.384 (0.442)	0.788 (0.388)	0.210 (0.292)
Ln remittance	-1.120*** (0.0854)	-1.353*** (0.0766)	-1.343*** (0.0570)	-1.092*** (0.0845)	-1.361*** (0.0763)	-1.334*** (0.0566)
Year2005	34.67*** (0.568)	33.06*** (0.497)	33.84*** (0.374)	35.05*** (0.562)	33.01*** (0.495)	33.96*** (0.371)
Year2012	38.43*** (0.549)	37.13*** (0.495)	37.86*** (0.367)	38.45*** (0.556)	37.26*** (0.497)	37.96*** (0.371)
Female	----- -----	----- -----	-3.950*** (0.334)	----- -----	----- -----	-4.083*** (0.332)
Observations	27,473	29,684	57,157	28,060	29,856	57,916
Left-censored	4,216	4,910	9,127	4,216	4,911	9,127
Wald (exogeneity)	5.33**	62.34***	39.93***	4.76**	53.96***	33.57***

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Although remittance was found to be an insignificant factor in reducing hours of unpaid work, it appears (in Table 3) to be significant in the case of hours of paid work for both males and females. At 1 percent level of significance, increase in remittance by 1 percent reduces hours of paid work for both sexes by a little over an hour per week. Relatively, the effect is higher for females than males. Across place of residence, remittance is insignificant although it depicts negative effect. The theoretical justification for such significantly negative effect is that remittance raises the reservation wage of individuals and discourages them from participating in labours market. It also induces substitution effect on individuals' time allocation to paid work because it increases their consumption of leisure (Ilahi, 2000).

While the first explanation may be more applicable to developed countries where there are employment opportunities and flexible labour market conditions, it is the second explanation that is more likely to support our findings. This is because remittance (either domestic or international) affects all facet of consumption expenditure and investment of many households in in developing countries including Ghana (Adams & Cuecuecha, 2013; Combes & Ebeke, 2011). We argue that due to the high unemployment rate and other unfavourable labour market conditions in developing countries, the concept of reservation wage and its perceived impact on labour market participation is more of theory than practice. Empirically, our findings lend support to the works of earlier researchers who find negative association between non-wage income and hours of paid work (Alderman & Chishti, 1991; Ilahi & Grimard, 2000; Ilahi & Jafarey, 1999).

Unlike the unpaid hours of work, we find age to have a nonlinear relationship with hours of paid work. While hours of paid work are increasing functions of age, at certain age levels,

individuals reduce their labour supply even if wage continues to increase. Across both gender and geographical location, age and the square of age are significant at 1 percent level. The sizes of the coefficients imply that additional increase in age increases the hours of work of females and rural residents more than males and urban residents. In the same vein, when paid hours of work begin to reduce due to further increase in age, the effect is higher for females and rural residents than males and urban residents. When both gender and place of residence are considered as variables in the models rather than sub-samples, we find urban residence to have negative effect on males and positive effect on females. Nonetheless, the results (in Tables 3 and 4) are insignificant for both sexes. It can be seen from Table 3 that at the 1 percent level of significance, females work less than 4 hours a week than males. This result confirms the descriptive analysis and the Ghana Living Standard Survey reports on higher employment among rural residents.

Table 4: Estimates of paid hours of across geographical location

Dependent variable (Paid hours)	Nominal wage			Real wage		
	Rural	Urban	All	Rural	Urban	All
Ln wage	1.352*** (0.496)	0.935*** (0.357)	0.640** (0.282)	0.992** (0.492)	0.772** (0.317)	0.435* (0.258)
Age	0.894*** (0.0629)	1.187*** (0.0822)	1.005*** (0.0499)	0.899*** (0.0628)	1.203*** (0.0820)	1.017*** (0.0498)
Age square	-0.011*** (0.0010)	-0.014*** (0.0010)	-0.011*** (0.0005)	-0.011*** (0.0010)	-0.014*** (0.0011)	-0.011*** (0.0010)
Informal	-0.552 (0.659)	-3.285*** (0.870)	-1.587 (0.527)	-0.424 (0.657)	-3.322*** (0.862)	-1.557 (0.525)
Single	-9.188*** (0.581)	-13.25*** (0.677)	-11.09*** (0.438)	-9.180*** (0.579)	-13.33*** (0.667)	-11.15*** (0.435)
Poor health	-3.077*** (0.511)	-4.019*** (0.596)	-3.485*** (0.388)	-3.108*** (0.510)	-3.986*** (0.593)	-3.503*** (0.387)
Spouse	8.064*** (0.602)	9.620*** (0.719)	8.595*** (0.459)	8.026*** (0.601)	9.732*** (0.715)	8.625*** (0.458)
Child/Grand child	20.49*** (0.688)	24.35*** (0.772)	22.21*** (0.512)	20.43*** (0.685)	24.43*** (0.761)	22.24*** (0.507)
Other relative	17.93*** (1.293)	26.68*** (1.333)	21.95*** (0.927)	17.86*** (1.290)	26.91*** (1.328)	22.02*** (0.925)
Servant/Adopted	25.20*** (2.980)	30.77*** (2.964)	27.62*** (2.100)	25.16*** (2.981)	31.20*** (2.963)	27.79*** (2.100)
Child under 5	1.341 (0.107)	1.367 (0.166)	1.314 (0.0897)	1.336 (0.106)	1.375 (0.165)	1.318 (0.0895)
Ln remittance	-1.158*** (0.0820)	-1.505*** (0.0797)	-1.343*** (0.0570)	-1.148*** (0.0818)	-1.492*** (0.0788)	-1.334*** (0.0566)

Female	-4.114*** (0.448)	-3.451*** (0.503)	-3.950*** (0.334)	-4.205*** (0.448)	-3.654*** (0.498)	-4.083*** (0.332)
Year2005	34.66*** (0.496)	32.55*** (0.579)	33.84*** (0.374)	34.72*** (0.496)	32.92*** (0.568)	33.96*** (0.371)
Year2012	39.12*** (0.501)	35.90*** (0.546)	37.86*** (0.367)	39.10*** (0.505)	36.07*** (0.552)	37.96*** (0.371)
Urban	----- -----	----- -----	0.0886 (0.293)	----- -----	----- -----	0.210 (0.292)
Observations	32,382	24,775	57,157	32,514	25,402	57,916
Left-censored	5,456	3,671	9,127	5,456	3,671	9,127
Wald(exogeneity)	30.42***	32.76***	39.93***	25.45	24.05***	33.57***

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

In addition to age, the relationship of the respondent to the household head has a positively significant association with the hours of paid work. Compared to the head of the household, the effects are higher for children, grandchildren and other members of the household. In Table 4, urban residents also work for more hours than their counterparts in the rural areas. One possible reason (though not the focus of this study) is that about 29 percent of children between 7 and 14 years who are economically active are engaged in one form of child labour or the other. Majority of these child labourers are found in the agriculture (51.8 percent), and wholesale and retail trade (29.8 percent) sectors where about a third (32.2 percent) of them work for at least 20 hours a week in order to contribute to the income of their respective households (Ghana Statistical Service, 2014).

Similar to the household head, we find that marital status is a crucial determinant of time allocation to paid work. Unexpectedly and contrary to some of the findings in the literature (Bloemen, Pasqua, & Stanca, 2010), we can see from Table 4 and 5 that the single and those who are in informal relationship or cohabitating work less than those who are married. This to some extent makes sense depending on the household specific features and social norms that determine time allocation. It could also be argued from an angle that the married are expected to have more responsibilities that require them to work for more hours in order to meet their financial demands. We infer from these results that married individuals particularly females and rural residents in Ghana are more likely to bear what is termed the literature as the “double burden of work” (Ferrant et al., 2014).

Health is an important human capital that determinant of one’s capacity to engage in productive activities and earn higher wages. On the other hand poor health reduces the ability to work and has substantial effects on individuals wages, labour force participation and job choice (Currie & Madrian, 1999; Hall, 1973). While we find poor health to have insignificant effects

on unpaid hours of work, it has significantly negative effects on hours of paid work across both gender and geographical location. At 1 percent level of significance, respondents who experienced some form of infirmity in the course of the week preceding the Ghana Living Standard Survey worked a little over 3 hours less than those who were in good health condition. Males in poor health condition worked a little over 4 hours less than their counterparts who were in good health condition. Likewise, females who were in poor health spent over 2 hours less on paid work compared to those who were in good health. This means that the effect of an episode of poor health is higher among males than females. In Table 4, the effect is higher among urban residents than rural residents. We conclude that our findings support both the theoretical predictions and available empirical evidence (Grossman, 2000).

Several empirical studies have documented that parents who have younger children have low probability of participating in the labour market. As such even if they participate, they are more likely to work part-time (Bianchi, 2000; Connelly, 1992). Although we find the number of children under five in the household to have negative association with the hours of paid work for both sexes and across geographical location, the results are consistently insignificant. Possibly, the insignificant effect of this variable on hours of paid work is due to the recent increase and affordability of day care centres particularly in the cities where parents are able to leave their younger children in the care of others while they are at work. As usual, we included the year dummies to capture the changes in the hours of work over the periods of the three surveys. The results in Tables 3 and 4, confirm Figure 1 in the descriptive analysis that between 1998 and 2013, there have been significant increase in the hours of paid work for both sexes and across geographical location. Compared to the reduction in the hours of unpaid, it appears that the increase in the paid work is higher. This makes it difficult for us to predict exactly how many hours that have been shifted from unpaid and leisure hours into hours of paid with the period under study.

Conclusion

We presented and discussed the descriptive and regression results on the first empirical objective. As a recap, we sought to examine the wage (both nominal and real) effect of intra-household time allocation to paid and unpaid with focus on the gender and geographical location of respondent. What we found from the descriptive analysis was that within the period of one and half decade (1998-2013), intra-household time allocated to unpaid work reduced considerably while hours allocated to paid work increased. This means that Ghanaians reallocated some of

their time from unpaid work to paid work. This shift in time was pervasive across gender and geographical location.

Although the gap has narrowed across gender and geographical location, females still continue to spend more time on unpaid work than males while males spend more time on the labour market than females. Similarly, rural residents spend more time on both paid and unpaid work than urban residents. The distribution of nominal and real wages (dependent variable of interest) shows a consistent increase in hourly wage within the period under study. Wage appears to be higher among males and urban residents than females and rural residents. The non-parametric regression analysis of the bivariate relationship between wage and time use depict some element of the backward bending labour supply curve for males, rural and urban resident but a downward relationship for females. It further shows an inverse relationship between hours of unpaid work and wage.

The regression analyses produced differential effects of wage on intra-household time allocation to paid and unpaid hours of work. As expected, wage reduces unpaid hours of work for both male and females as well as rural and urban residents. However, the results remain significant for only females and rural residents in spite of the fact that these categories of respondents receive lower average wages than males and urban residents. Wage has negative effect (income effect) on the labour supply of females but positive effect (substitution effect) for males. Thus increases in wage increases males labour supply but reduces females labour supply. Real wage has higher effects on hours of unpaid work than nominal wage while nominal wage has higher effect on paid work than real wage, suggesting an element of money illusion among Ghanaians. These differential effects of changes in wage on time allocation require that policies that seek to use wage as an instrument to achieve gender and spatial equality in labour force participation, labour supply and household production will have to consider these factors.

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Appendix

Table A1: First stage estimates of unpaid hours of work by gender

Dependent variable (wage)	Nominal wage			Real wage		
	Male	Female	All	Male	Female	All
Age	0.0155*** (0.00229)	0.00703*** (0.00120)	0.0116*** (0.00118)	0.0137*** (0.00295)	0.00499** (0.00229)	0.00919*** (0.00182)
Age square	-0.00023*** (2.22e-05)	-8.61e-05*** (1.21e-05)	-0.00016*** (1.19e-05)	-0.00018*** (2.92e-05)	-2.87e-05 (2.33e-05)	-0.00010*** (1.84e-05)
Informal	0.177*** (0.0303)	0.0306** (0.0145)	0.0966*** (0.0161)	0.0787** (0.0316)	0.0286 (0.0273)	0.0413** (0.0205)
Single	0.0754*** (0.0250)	0.0160 (0.0158)	0.00938 (0.0138)	-0.0374 (0.0274)	-0.00148 (0.0259)	-0.0565*** (0.0175)
Poor health	0.00663 (0.0200)	0.00436 (0.0106)	-0.00639 (0.0106)	-0.0644*** (0.0243)	-0.0618*** (0.0204)	-0.0670*** (0.0156)
Spouse	-0.216*** (0.0521)	-0.0675*** (0.0156)	-0.191*** (0.0121)	-0.0921 (0.0693)	0.352*** (0.0254)	0.208*** (0.0195)
Child/Grand	-0.409*** (0.0271)	-0.0950*** (0.0160)	-0.256*** (0.0149)	-0.0125 (0.0319)	0.170*** (0.0238)	0.0661*** (0.0194)
Other relative	-0.418*** (0.0388)	-0.0646** (0.0261)	-0.242*** (0.0223)	0.304*** (0.0670)	0.474*** (0.0588)	0.376*** (0.0441)
Servant/Adopted	-0.216** (0.0891)	-0.0597 (0.0572)	-0.144*** (0.0530)	0.653*** (0.155)	1.059*** (0.168)	0.839*** (0.114)
Child under5	-0.0146*** (0.00347)	-0.00456*** (0.00171)	-0.00828*** (0.00184)	-0.00184 (0.00381)	-0.00242 (0.00295)	-0.00141 (0.00236)
Urban	0.346*** (0.0145)	0.140*** (0.00806)	0.237*** (0.00823)	0.613*** (0.0190)	0.486*** (0.0168)	0.549*** (0.0127)
Ln remittance	-0.0128*** (0.00286)	-0.00661*** (0.00175)	-0.0115*** (0.00163)	-0.0274*** (0.00402)	-0.0276*** (0.00362)	-0.0294*** (0.00268)
Year2005	Yes	Yes	Yes	Yes	Yes	Yes
Year 2012	Yes	Yes	Yes	Yes	Yes	Yes
Union	1.667*** (0.0340)	1.650*** (0.0515)	1.671*** (0.0285)	1.478*** (0.0352)	1.372*** (0.0560)	1.458*** (0.0298)
Education	0.192*** (0.0194)	0.335*** (0.0190)	0.263*** (0.0138)	0.430*** (0.0257)	0.598*** (0.0324)	0.504*** (0.0202)
Sector	0.599*** (0.0273)	0.498*** (0.0232)	0.542*** (0.0183)	0.672*** (0.0285)	0.543*** (0.0251)	0.609*** (0.0193)
Female	----- -----	----- -----	-0.137*** (0.00821)	----- -----	----- -----	-0.0866*** (0.0134)
Constant	-0.535*** (0.0624)	-0.339*** (0.0364)	-0.311*** (0.0326)	-0.726*** (0.0771)	-0.675*** (0.0639)	-0.599*** (0.0475)
Observations	29,373	31,009	60,382	30,014	31,194	61,208

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A 2: First stage estimates of unpaid hours of work by geographical location

Dependent Variable (wage)	Nominal wage			Real wage		
	Rural	Urban	All	Rural	Urban	All
Age	0.00168 (0.00114)	0.0295*** (0.00242)	0.0116*** (0.00118)	0.000573 (0.00174)	0.0231*** (0.00366)	0.00919*** (0.00182)
Ages square	-4.35e-05*** (1.12e-05)	-0.00038*** (2.50e-05)	-0.00016*** (1.19e-05)	-2.04e-05 (1.71e-05)	-0.00027*** (3.79e-05)	-0.00010*** (1.84e-05)
Spouse	0.0508*** (0.0161)	0.161*** (0.0324)	0.0966*** (0.0161)	0.0455** (0.0216)	0.0522 (0.0396)	0.0413** (0.0205)
Single	0.00458 (0.0142)	-0.0140 (0.0254)	0.00938 (0.0138)	-0.0123 (0.0186)	-0.105*** (0.0315)	-0.0565*** (0.0175)
Poor health	0.0141 (0.0111)	-0.0321* (0.0194)	-0.00639 (0.0106)	0.00258 (0.0168)	-0.128*** (0.0278)	-0.0670*** (0.0156)
Spouse	-0.130*** (0.0117)	-0.297*** (0.0240)	-0.191*** (0.0121)	0.0520*** (0.0193)	0.378*** (0.0367)	0.208*** (0.0195)
Child/Grand	-0.173*** (0.0160)	-0.350*** (0.0263)	-0.256*** (0.0149)	-0.0467** (0.0208)	0.202*** (0.0341)	0.0661*** (0.0194)
Other relative	-0.189*** (0.0246)	-0.261*** (0.0372)	-0.242*** (0.0223)	0.115** (0.0510)	0.657*** (0.0700)	0.376*** (0.0441)
Servant/Adopted	-0.134** (0.0563)	-0.129 (0.0850)	-0.144*** (0.0530)	0.349** (0.137)	1.236*** (0.170)	0.839*** (0.114)
Child under5	-0.00747*** (0.00163)	-0.0134*** (0.00474)	-0.00828*** (0.00184)	-0.00506** (0.00209)	-0.0192*** (0.00590)	-0.00141 (0.00236)
Ln remittance	0.000308 (0.00184)	-0.0204*** (0.00262)	-0.0115*** (0.00163)	0.00105 (0.00311)	-0.0453*** (0.00422)	-0.0294*** (0.00268)
Female	-0.0732*** (0.00799)	-0.223*** (0.0152)	-0.137*** (0.00821)	-0.0191 (0.0137)	-0.186*** (0.0238)	-0.0866*** (0.0134)
Year2005	Yes	Yes	Yes	Yes	Yes	Yes
Year 2012	Yes	Yes	Yes	Yes	Yes	Yes
Union	1.664*** (0.0439)	1.566*** (0.0403)	1.671*** (0.0285)	1.567*** (0.0459)	1.381*** (0.0413)	1.458*** (0.0298)
Education	0.232*** (0.0199)	0.265*** (0.0183)	0.263*** (0.0138)	0.450*** (0.0301)	0.523*** (0.0262)	0.504*** (0.0202)
Sector	0.379*** (0.0199)	0.731*** (0.0400)	0.542*** (0.0183)	0.379*** (0.0209)	0.720*** (0.0406)	0.609*** (0.0193)
Urban	----- -----	----- -----	0.237*** (0.00823)	----- -----	----- -----	0.549*** (0.0127)
Constant	-0.112*** (0.0336)	-0.316*** (0.0624)	-0.311*** (0.0326)	-0.227*** (0.0476)	-0.468*** (0.0911)	-0.599*** (0.0475)
Observations	34,251	26,131	60,382	34,398	26,810	61,208

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A3: First stage estimates of paid hours of work by gender

Depend var.	Nominal wage			Real wage		
Total hours	Male	Female	All	Male	Female	All
Age	0.011*** (0.00251)	0.0048*** (0.00131)	0.0084*** (0.00134)	0.012*** (0.0027)	0.0049*** (0.00137)	0.0094*** (0.00143)
Age square	-0.0002*** (2.58e-05)	-0.0001*** (1.41e-05)	-0.0001*** (1.42e-05)	-0.0002*** (2.75e-05)	-0.0005*** (1.48e-05)	-0.0002*** (1.51e-05)
Informal	0.155*** (0.0249)	0.0262* (0.0137)	0.0854*** (0.0138)	0.0631** (0.0264)	0.00118 (0.0144)	0.0315** (0.0147)
Single	0.0809*** (0.0215)	0.00736 (0.0139)	0.0102 (0.0120)	0.0181 (0.0228)	-0.0235 (0.0144)	-0.0312** (0.0127)
Poor health	-0.00278 (0.0198)	0.0127 (0.0103)	-0.00521 (0.0107)	-0.0379* (0.0210)	-0.00293 (0.0108)	-0.0308*** (0.0113)
Spouse	-0.235*** (0.0604)	-0.0743*** (0.0136)	-0.190*** (0.0130)	-0.256*** (0.0644)	-0.0808*** (0.0142)	-0.199*** (0.0138)
Child/Grand	-0.448*** (0.0241)	-0.109*** (0.0132)	-0.277*** (0.0132)	-0.419*** (0.0256)	-0.0889*** (0.0137)	-0.253*** (0.0140)
Other relative	-0.485*** (0.0419)	-0.0872*** (0.0228)	-0.278*** (0.0230)	-0.521*** (0.0445)	-0.101*** (0.0238)	-0.308*** (0.0245)
Servant/Adopt	-0.326*** (0.0839)	-0.225*** (0.0518)	-0.269*** (0.0496)	-0.416*** (0.0895)	-0.246*** (0.0543)	-0.326*** (0.0529)
Child under 5	-0.0144*** (0.00447)	-0.00428* (0.00239)	-0.0082*** (0.00245)	-0.00647 (0.00477)	-0.000763 (0.00251)	-0.00192 (0.00261)
Urban	0.331*** (0.0139)	0.125*** (0.00800)	0.221*** (0.00792)	0.357*** (0.0147)	0.121*** (0.00837)	0.231*** (0.00841)
Ln remittance	-0.0150*** (0.00281)	-0.0072*** (0.00157)	-0.0130*** (0.00157)	-0.0194*** (0.00297)	-0.0088*** (0.00163)	-0.0161*** (0.00166)
Year2005	Yes	Yes	Yes	Yes	Yes	Yes
Year2012	Yes	Yes	Yes	Yes	Yes	Yes
	(0.0244)	(0.0129)	(0.0133)	(0.0259)	(0.0135)	(0.0141)
Union	1.631*** (0.0250)	1.663*** (0.0222)	1.648*** (0.0170)	1.576*** (0.0258)	1.716*** (0.0225)	1.629*** (0.0176)
Education	0.185*** (0.0167)	0.328*** (0.0118)	0.257*** (0.0105)	0.276*** (0.0176)	0.367*** (0.0123)	0.329*** (0.0110)
Sector	0.565*** (0.0222)	0.460*** (0.0140)	0.506*** (0.0132)	0.606*** (0.0231)	0.512*** (0.0145)	0.554*** (0.0139)
Female	----- -----	----- -----	-0.129*** (0.00904)	----- -----	----- -----	-0.125*** (0.00961)
Constant	-0.373*** (0.0644)	-0.266*** (0.0356)	-0.213*** (0.0344)	-0.391*** (0.0685)	-0.287*** (0.0372)	-0.250*** (0.0366)
Observations	27,473	29,684	57,157	28,060	29,856	57,916

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.

Table A4: First stage estimation of paid hours of work by geographical location

Depend var.	Nominal wage			Real wage		
Total hours	Rural	Urban	All	Rural	Urban	All
Age	0.000664 (0.00128)	0.0230*** (0.00269)	0.0084*** (0.00134)	0.000704 (0.00132)	0.0251*** (0.00287)	0.0094*** (0.00143)
Age square	-0.00003** (1.34e-05)	-0.0003*** (2.88e-05)	-0.0001*** (1.42e-05)	-0.00002** (1.38e-05)	-0.0003*** (3.08e-05)	-0.0001*** (1.51e-05)
Informal	0.0376*** (0.0130)	0.155*** (0.0279)	0.0854*** (0.0138)	0.0224* (0.0134)	0.0542* (0.0298)	0.0315** (0.0147)
Single	0.000667 (0.0120)	-0.00800 (0.0224)	0.0102 (0.0120)	-0.0129 (0.0123)	-0.0777*** (0.0237)	-0.0312** (0.0127)
Poor health	0.00633 (0.0105)	-0.0206 (0.0201)	-0.00521 (0.0107)	-0.00172 (0.0109)	-0.0569*** (0.0214)	-0.0308*** (0.0113)
Spouse	-0.131***	-0.293***	-0.190***	-0.124***	-0.329***	-0.199***

	(0.0128)	(0.0249)	(0.0130)	(0.0132)	(0.0264)	(0.0138)
Child/Grand	-0.175***	-0.400***	-0.277***	-0.165***	-0.357***	-0.253***
	(0.0134)	(0.0244)	(0.0132)	(0.0138)	(0.0259)	(0.0140)
Other relative	-0.193***	-0.332***	-0.278***	-0.191***	-0.374***	-0.308***
	(0.0246)	(0.0401)	(0.0230)	(0.0254)	(0.0428)	(0.0245)
Servant/Adopt	-0.199***	-0.323***	-0.269***	-0.230***	-0.402***	-0.326***
	(0.0532)	(0.0855)	(0.0496)	(0.0549)	(0.0916)	(0.0529)
Child under5	-0.0071***	-0.0130**	-0.0082***	-0.00517**	-0.00502	-0.00192
	(0.00218)	(0.00560)	(0.00245)	(0.00225)	(0.00599)	(0.00261)
Ln remittance	-0.000247	-0.0220***	-0.0130***	-0.00132	-0.0242***	-0.0161***
	(0.00170)	(0.00268)	(0.00157)	(0.00175)	(0.00284)	(0.00166)
Female	-0.0660***	-0.215***	-0.129***	-0.0579***	-0.221***	-0.125***
	(0.00915)	(0.0166)	(0.00904)	(0.00943)	(0.0177)	(0.00961)
Year2005	Yes	Yes	Yes	Yes	Yes	Yes
Year2012	Yes	Yes	Yes	Yes	Yes	Yes
Union	1.631***	1.553***	1.648***	1.546***	1.538***	1.629***
	(0.0201)	(0.0285)	(0.0170)	(0.0204)	(0.0292)	(0.0176)
Education	0.235***	0.256***	0.257***	0.288***	0.335***	0.329***
	(0.0132)	(0.0161)	(0.0105)	(0.0136)	(0.0171)	(0.0110)
Sector	0.326***	0.702***	0.506***	0.338***	0.794***	0.554***
	(0.0132)	(0.0282)	(0.0132)	(0.0136)	(0.0290)	(0.0139)
Urban	-----	-----	0.221***	-----	-----	0.231***
	-----	-----	(0.00792)	-----	-----	(0.00841)
Constant	-0.0483	-0.173***	-0.213***	-0.0635*	-0.203***	-0.250***
	(0.0332)	(0.0671)	(0.0344)	(0.0342)	(0.0715)	(0.0366)
Observations	32,382	24,775	57,157	32,514	25,402	57,916

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A5: Weak Instrument Robust Tests and Confidence Sets (unpaid working hours)

Test	Male		Female		Rural		Urban		All	
	Statistic	P-value	Statistic	P-value	Statistic	P-value	Statistic	P-value	Statistic	P-value
Nominal wage										
CLR	0.66	0.42	4.13	0.42	5.94	0.15	4.13	0.42	4.13	0.42
AR	20.05	0.23	88.69	0.11	51.99	0.22	88.69	0.53	88.69	0.11
J	19.39	0.19	75.41	0.32	46.07	0.15	84.58	0.44	84.58	0.25
WCI	-1.5612, 1.0239		-1.7711, 0.0262		-3.1064, 0.7247		-1.5794, 0.5008		-1.5794, 0.5008	
WICI	-0.9149, 0.3776		-1.7624, -0.0351		-2.1486, -0.2331		-1.0594, 0.0193		-1.0594, -0.0193	
Real wage										
CLR	1.85	0.17	6.66	0.91	7.15	0.75	2.97	0.85	8.28	0.40
AR	21.77	0.31	81.87	0.21	52.64	0.24	47.11	0.33	92.64	0.11
J	19.93	0.71	75.25	0.12	45.51	0.18	44.15	0.50	84.39	0.13
WCI	-1.6128, 0.7822		-2.5664, 0.5303		-3.1661, 0.5978		-1.5261, 0.5942		-1.6431, 0.2522	
WICI	-1.0141, 0.1834		-1.7922, -0.2439		2.2251, -0.3432		-0.9961, 0.0639		-1.1692, -0.2216	

Note: Conditional Likelihood ratio (CLR), Anderson-Rubin (AR), overidentification (J), Weak-Instrument Confidence Interval (WICI) and Wald Confidence Interval (WCI)

Table A6: Weak Instrument Tests and Confidence Sets (Paid working hours)

Test	Male		Female		Rural		Urban		All	
Nominal wage	Statistic	P-value	Statistic	P-value	Statistic	P-value	Statistic	P-value	Statistic	P-value
CLR	16.50	0.45	4.20	0.43	7.62	0.58	6.84	0.89	5.34	0.21
AR	23.67	0.71	54.15	0.56	34.80	0.35	38.08	0.47	42.29	0.44
J	17.63	0.59	50.03	0.25	27.58	0.34	37.31	0.71	37.09	0.43
WCI	1.0514, 3.0209		-3.9322, 1.1891		0.7506, 4.6408		0.6402, 3.2147		0.6550, 2.4572	
WICI	.0667, 4.0057		-2.6519, -0.0913		0.5973, 3.2931		0.3236, 2.2510		0.1234, 1.6794	
Real wage										
CLR	10.10	0.15	3.43	0.64	4.19	0.41	5.94	0.15	2.96	0.86
AR	26.64	0.20	45.84	0.24	30.93	0.53	39.51	0.37	25.68	0.42
J	19.82	0.16	42.47	0.24	26.97	0.52	33.63	0.27	22.79	0.34
WCI	0.5640, 2.3956		-3.3746, 1.1719		0.0398, 2.7971		0.6418, 2.7518		0.8101, 2.0297	
WICI	0.3518, 3.3114		-2.2382, -0.0352		1.3388, 4.1757		0.2066, 1.9034		0.1002, 1.3197	

Note: Conditional Likelihood ratio(CLR), Anderson-Rubin (AR), overidentification (J), Weak-Instrument Confidence Interval (WICI) and Wald Confidence Interval (WCI)

In Table A7: Variable measurement and definition.

Variable	Measurement	Definition
<i>Hours</i>	Continuous	The number of hours (paid and unpaid) worked per week
<i>lnwage</i>	Continuous	Hourly wage (both nominal and real wages)
<i>lnremit</i>	Continuous	The natural log of remittance (proxy for non-wage income)
<i>Age</i>	Continuous	The age of respondent
<i>Agesq</i>		Square of the respondent's age
<i>Msatus</i>	Categorical	Marital status (Married=1, Informal relationship=2, Single=3)
<i>Hstatus</i>	Binary	Health status (Poor health=1; Good health=0)
<i>RHH</i>	Categorical	Relationship to household head (Head=1; Spouse=2; Child/Grandchild=3; Other relative=4; Servant/Adopted=5)
<i>hild</i>	Continuous	The number of children under 5 years of age
<i>Urban</i>	Binary	Place of residence (Urban=1; Rural=0)
<i>Female</i>	Binary	Gender of respondent (Female=1; Male=0)
<i>Ethnic</i>	Categorical	Ethnic group of respondent (Akan=1, Ga-Dangme =2, Ewe=3, Guan=4, Mole-Dagbani=5, Grusi=6, Gurma=7, other ethnic=8)
<i>Edu</i>	Categorical	Education level of respondent (None=1, Basic=2, Secondary plus=3)