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Youth agrifood system employment in developing countries: a gender-differentiated spatial approach

by
Michael Dolislager
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Aslihan Arslan
Louise Fox
Saweda Liverpool-Tasie
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Abstract

Despite a burgeoning literature on youth employment, little is known about the economic activities of rural youth, including whether rural transformation, seen through the lens of the agrifood system (AFS) will create new opportunities for youth. Using data on hours worked of 467,453 working-age individuals in four age cohorts (early youth, later youth, early adulthood, later adulthood) and a rural-urban gradient based on population density (rural hinterland, intermediate, peri-urban and urban zones) in 188,996 households in Africa, Asia, and Latin America, we provide empirical evidence on this gap in literature. We find that no region allocates more than 37 per cent of their labour hours to on-farm employment, but when including off-farm AFS self- and wage employment, total AFS accounts for half of all hours worked. Even in Latin America, off-farm AFS accounts for 21 per cent of hours worked, demonstrating the importance of pre- and post-farm value added for employment creation. Youth appear to access off-farm AFS opportunities more easily than non-AFS ones, especially wage employment in urban and peri-urban zones. These findings dispute the narrative that youth do not enter farming and cannot get wage jobs, as youth work substantial hours in both sectors with distinct spatial patterns.

1. Introduction

The past two decades have seen an explosion of interest in and an increased policy and programmatic focus on youth employment in the developing world. A driver of the focus is that nearly 90 per cent of all young people live in developing countries (ILO, 2017). In African countries with high fertility and lower per capita income growth, there is a concern about the political, social and economic consequences of a working age population that has become younger (Filmer and Fox, 2014; IDRC, 2015; World Bank, 2018; African Development Bank, 2016). In Asia, youth as a share of the working age population has stabilized and is declining, but the share of youth neither in employment nor in education or training is rising, as is the share of unemployed youth (World Bank, 2018). In most Latin American countries the population and workforce are aging but youth unemployment remains high (Fox and Kaul, 2018).

In response, the field of 'youth labour economics' has emerged (Fox et al. 2016; Filmer and Fox, 2014; O'Higgins 2003). Fox and Kaul (2018) note that most research and policy debate in this literature has focused on youth's participation in the formal wage sector and has rarely (with a few exceptions such as Fox and Thomas, 2016) treated participation in the informal sector or agriculture, despite the latter's importance in developing countries. The formal wage sector focus has generated a literature mainly on urban areas (given there is little formal wage employment in rural areas), despite the fact that over half of the youth population in developing countries lives and works in rural areas.

Rural employment, as a determinant of rural incomes and welfare, has been a major concern in development economics. A case in point has been the literature on RNFE (rural nonfarm employment; e.g. Reardon et al. 1992, Reardon 1997, Barrett et al. 2001, Haggblade et al. 2007, and Davis et al. 2010 & 2017). RNFE studies analysed off-farm employment in manufacturing and services, mostly in the informal sector, with differentiation by gender and subsector, and found RNFE to account for a third to a half of rural incomes in developing regions, averaging 45 per cent (Haggblade et al. 2007), therefore of extreme importance. Many RNFE studies distinguished rural zones with developed versus under-developed agriculture, favourable versus unfavourable agroecological conditions, and thus highlighted production and consumption linkages associated with RNFE. RNFE studies distinguished areas close to and far from cities, hence different rural zones. But seldom did the RNFE literature touch on age cohorts or youth employment per se, nor use a globally comparable spatial perspective. The RNFE literature also rarely addressed urban employment opportunities related to agricultural production.

Increasingly, the literature on farm and nonfarm employment is incorporating the concept of the agrifood system, or AFS, defined as the set of supply chains stretching from the supply of inputs and services, through production on the farm and all the post-farm activities that result in the retailing of food (including food prepared and consumed away from home) and other agricultural commodities to consumers. The AFS concept recognizes the integration of these supply chains spatially as they transform, and the extensive income earning opportunities the transformation opens up (Reardon et al., 2019). For example, the RNFE literature showed that in

zones with abundant AFS activity (arising from linkages with farm sector growth usually related to favourable agro-climatic areas), women more easily found off-farm jobs that had low requirements for entry in terms of capital and skills. AFS jobs were found to be 'easy access' and in Africa, Asia, and Latin America, more developed cropping areas had more poor in these jobs and less inequality than other zones (Reardon et al. 2000). On the other hand, there is emerging evidence that the AFS is developing rapidly in both urban and rural areas of developing regions, driven by urbanization, diet change into processed foods, the rise of purchases of food in rural areas, the rise of consumption of non-food grains, infrastructure development such as rural-urban road links, and farm response to growing demand (by diversifying production, commercializing, and intensifying) (Tschirley et al., 2015). This is giving rise to the rapid proliferation of SMEs in the AFS segments, in rural and urban areas (Reardon et al. 2019). AFS development, especially in lower income countries and regions where the transformation is just beginning, is expected to provide more opportunities for employment compared to several decades ago.

This paper contributes to the literature on RNFE and AFS employment by adding a youth dimension, and to the literature on youth employment by adding the rural and AFS dimension. So little is actually known about youth employment with the AFS system that adding the age disaggregation already offers a substantial contribution to developing country rural and youth employment discussions by revealing the associations between agricultural development and employment opportunities for youth, just as adding the gender disaggregation did in previous analyses. However, this paper goes further than most other papers on youth employment by using the concept of Full Time Equivalents (FTE), which measures total time spent in a given economic activity (job) rather than the conventional approach of simply measuring the presence of an activity itself in a livelihood portfolio. This generates new, internationally comparable estimates of the extent and nature of youth's economic activity in both rural and urban areas.

In addition, while much of the debate is either urban focused or considers binary definitions of urban versus rural, we hypothesize, inspired by the spatial findings of the RNFE literature (such as Deichmann et al. 2009 for Bangladesh, or Reardon et al. 2001 for Latin America), that there is substantial variation in youth employment over types of rural areas. The dynamics in the AFS mentioned above are increasingly connecting the rural to urban areas creating a 'rural-urban gradient' that shapes rural youth opportunities in important ways (IFAD 2019). We thus add to the debate a globally comparable definition of 'rural-urban gradient' and analyse how sectoral and functional employment patterns change across the urban, peri-urban, intermediate, and hinterland zones.

In this study, we use the largest individual level data to date on the employment of 467,453 working-age individuals in four age cohorts (early youth, later youth, early adulthood, later adulthood) in 188,996 households in Africa, Asia, and Latin America. We control for four dimensions: (1) employment types and participation in the AFS wage- and self-employment jobs, own-farming, farm wage employment and non-AFS wage- and self-employment; (2) spatial heterogeneity by controlling for population density-based rural-urban gradient, and satellite-based local agricultural potential; (3) age cohorts emphasized in the youth labour economics literature by separating adolescents, older youths, young adults and older adults; and (4) gender.

The paper proceeds as follows. In section 2 we lay out definitions and data sources. In section 3 we present descriptive findings for labour force participation (LFP) and for composition of full time equivalents (FTEs) of individuals of all working age cohorts in all employment categories. We present our empirical model specification to better understand the outcomes observed in

descriptive analysis in section 4, present the econometric results in section 5 and conclude in section 6.

2. Definitions and data

Employment in the farm sector consists of work on the family farm ('own-farm employment') and farm wage employment (on the farms of others). Employment in the nonfarm sector consists of self-employment (in a home based enterprise or one outside the home, of the owner and of other family members working with him or her) and wage-employment. These activities can be in the formal or informal sector, and in manufacturing such as shoe or bread making, and services such as retail or wholesale trade, transport, informal finance or food service. Nonfarm employment can be further segregated into 'AFS employment' and non-AFS employment. We define AFS employment as employment in agricultural and food product processing, logistics, wholesale, retail, and food service (such as food stalls).

We analyse the composition of individuals' total time spent in employment in the following six categories:

a) Own-farming
b) Farm wage
c) (Off-farm) AFS wage
d) (Off-farm) AFS self
e) Non-AFS wage
f) Non-AFS self

Our main variable of interest is the time individuals in the labour force spend on an economic activity that is considered employment (Full Time Equivalent or FTEs). FTE takes into account actual hours worked, not just participation in a sector or type of activity. FTEs are estimates of the amount of time that an individual works in a particular activity, relative to a standard benchmark of 40 hours per week (FTE = 1.0). Someone who is not in the workforce has an FTE of zero[i], while someone working half-time in an activity over the course of the past year would have an FTE of .5 for that activity. Working full time is assumed to be 12 months per year, 21 days per month, and eight hours per day. We also capped FTEs at two per individual to control for a small number of outliers.

We use the standard age range of 15-64 for the economically active population. In fact, this range undercounts the total labour effort per employment sector. The undercounting is because at least some below 15 and above 64 are likely to be employed. The extent of the undercounting is difficult to assess because some of the countries' surveys asked about employment outside the standard age range and others did not. For country surveys that did track that employment, in an analysis separate from this paper we found that as a share of total FTEs for all employment sectors (hence the total employment effort) in our three-regions, children's employment constituted 2.3 per cent, and the elderly (65 and over), 4.7 per cent of total FTEs. In African countries, however, the total employment effort outside the age range was much higher than the other two regions (similar results were found in Filmer and Fox, 2014). We distinguish four age categories (older adults, 35-64; younger adults, 25-34; older youths, 18-24; adolescents, 15-17) within the economically population to analyse differences in employment by age tier.

Our analysis is based on socioeconomic household surveys (LSMS in Africa and other national surveys in other regions) developed by national statistical services in 13 countries three developing regions: Africa (short for Sub-Saharan Africa), represented by Ethiopia, Malawi, Niger, Nigeria, Tanzania, and Uganda; Asia, represented by Bangladesh, Cambodia, Indonesia, and Nepal; and Latin America, represented by Mexico, Nicaragua, and Peru. These were selected for variation in country development and size[ii] and by data availability. Table 1 shows the countries and the details of the survey data used. With the exceptions of the Indonesia Family Life Survey (with a sample representing 83 per cent of the population) and the Nicaragua National Household Living Standard Measurement Survey (rural households only), all the surveys are nationally representative and cover urban and rural areas. The regional descriptive statistics are population-weighted over countries within our sample.

The creation of the four population density-based zones[iii] of the rural-urban gradient involved mapping households to zones as follows. In Africa, we drew artificial boundaries around the geo-referenced centroids for each Enumeration Area (EA) in the surveys. This captured the average EA population based on known densities from WorldPop[iv]. In Asia and LAC, the survey data do not include geo-referenced information, but they provide centroids of municipalities/other small units with boundaries for relatively small administrative areas in DIVA-GIS[v]. We included any data set with boundary data for an administrative unit whose average size is 1,000 square km or less. This size allowed us to contain the administrative unit within a circle of 50km radius around the unit's centroid. The population densities of the study countries were divided into quartiles that correspond to the rural-urban gradients (our four zones). The densest quartile represents the urban areas. The rural areas are split into the second densest zone (peri-urban), the third most dense (intermediate), and the least dense (hinterland). Each EA or administrative unit has been classified into one of these four zones. This rural-urban gradient is a proxy for connectivity to markets and can be thought to correspond to economic or employment advantage.

3. Descriptive Statistics

3.1 Participation in the labour force

Even at the most aggregated level, descriptive analysis shows substantially different participation rates and employment patterns across regions, gender, and youth versus adults. The following patterns emerge from Table 2, which shows labour force participation rates (LFPR), calculated as the shares of individuals in the working age range 15-64 who participated in the labour force at some point over the last year.

Globally, most youth remain out of the labour force, especially in the lowest age range. Africa is an outlier here, as 57 per cent of Africans of age 15-17 participated during the year. Youth begin to participate more as they get older, although in every region the majority of young women still do not participate. Controlling for region and zone, the LFPR tends to rise by large increments from adolescents to older youths to young adults and plateau among older adults; overall the LFPR rises from a quarter to three quarters. The initial two increments are much higher for Asia and LAC than for Africa.

Globally the female LFPR of 53 per cent is well below the male rate of 79 per cent, a ratio of 1.5. The difference is highest in Asia (1.9 times) versus Africa (1.2 times). Surprisingly, over age groups globally and by region the same gender ratio roughly persists. Lower female labour force participation in Asia in all age groups reflects a lack of socially acceptable employment opportunities (Jacoby and Dasgupta, 2015). Female participation at all age ranges is higher in the more rural areas than in urban areas, again, this is most evident in Asia.

For all regions and age groups taken together, the LFPR is similar between urban and peri-urban areas (at around 60 per cent) and then jumps to about 75 per cent for the intermediate zone and to almost 80 per cent for the rural hinterland. For age groups other than adolescents, the share declines from urban to peri-urban and then increases towards intermediate and hinterland zones. For adolescents the LFPR increases stepwise as one moves from urban to hinterland.

3.2. Shares of FTEs in total employed time by sector

In this section, we analyse how individuals allocate their time among economic activities by computing the share of total FTEs recorded that were allocated to one type of employment for all individuals in a given group. It provides a first look at the types of work – on-farm, off-farm, AFS vs. non-AFS, and wage vs. self-employed – in the livelihoods of subsets of populations mentioned above. The values in Table 3 are unconditional (weighted) averages, therefore do not control for selectivity or other factors, which we do in our econometric analysis in the next section. Nonetheless, the following patterns reflect substantial differences in employment across region, population density, and ages.

3.2.1. On-Farm Employment

When considering the combined shares of own-farm and farm wage employment, it is important to note that in no region does the labour force as a whole spend the majority of its time on the farm, even in Africa (37 per cent) where it is widely asserted that the majority of employment is found in farm labour. As would be expected, the highest shares of total on-farm employment within each global region is found in the hinterland zones, ranging from 50 per cent (in LAC) to 61 per cent (in Asia). Below are several further observations of note for on-farm labour.

For all ages, own-farm FTE shares fall from hinterland to urban zones but with variation by age group. For all of the rural zones, there is a J-shaped curve from older adults to adolescents, with moderate shares among the oldest, dropping fast to older young adults and older youths and then sharply back up for adolescents. This makes sense as own-farming is the easiest entry activity for the youth in the rural areas that participate in the labour force, and older adults tend to be the farm owners.

For urban areas, the share of own-farm labour is very low for Asia and zero for LAC. Interestingly there is a sharp J curve in Africa with adolescents allocating around 17 per cent of their FTEs to own-farming in cities. This could be because of relatively difficult access to nonfarm jobs in urban areas for the adolescents, who may be commuting between rural and urban areas to combine various jobs throughout the year.

We find that farm wage employment in total FTEs is a minor share overall, equally for all age groups. Globally, in all rural zones the share of farm wage labour is around 10 per cent. It is slightly

higher in the hinterland (except in Africa) and drops to 2 per cent in urban areas. Surprisingly, this pattern of constancy over rural zones holds for all the age groups.

There are regional differences regarding shares of farm wage employment. For all ages taken together, Africa and Asia show a plateau in rural areas then a drop to a low share in urban areas. But compared with Africa, the shares in Asia are three times higher in the hinterland and intermediate zones, and seven times higher in peri-urban areas. This is explained by the greater share of landless and more irrigated, multi-seasonal intensified cropping in Asia. Yet for all that the share of farm wage employment is only 12 per cent in Asian rural areas, compared with 4 per cent in Africa. (These low shares are also seen in the review by Haggblade et al. 2007). By contrast, the farm wage labour share drops very rapidly from 18 to 12 to six in LAC as one moves from hinterland to peri-urban areas.

In the hinterland zone, for Asia and Africa, there is an inverted U curve over ages for the farm wage share. For LAC, the share slowly rises from old to young with a jump up to older-youth and adolescents. In the intermediate zones, in Asia and Africa, all ages have similar behaviour but there is a lower plateau for adults with a step up for youth. For LAC there is similar pattern but sharper step up for the adolescents. For peri-urban areas, in Asia, there is a very shallow U curve and the shares are nearly twice those in LAC (and seven times those in Africa). The results for youth make sense in all three regions given the low entry requirements and barriers to get a job in farm wage labour, the least skilled job.

3.2.2. AFS wage- and self-employment

We find that total AFS employment is a significant portion of employment. Globally, it shifts from 18 per cent in the hinterland zone, 19 per cent in the intermediate, 22 per cent in the peri-urban areas, and 26 per cent in urban areas. The consistency of the share across regions suggests that even as countries develop and new industries and production units emerge, the AFS sectors remain and important source of employment. This reflects the importance of downstream processing and selling of agriculturally based products in urban areas – the integration of supply chains across space.

Globally, for AFS wage-employment in hinterland and intermediate zones, the older youths have more than double the shares of older adults. However, in the peri-urban and urban areas, all youths depend much more on AFS wage employment, with higher shares among adolescent and older youths (with shares of 19-29 per cent and 19-24 per cent), compared to adult shares of 8-12 per cent. In all the zones but the intermediate, the youth participate less than do adults on AFS self-employment, and more in wage employment. There is a small rise from youth to adults in self-employment in the hinterland, then surprisingly little difference over age groups in the intermediate zone, but a U curve in peri-urban and urban areas. These youth-adult differences reflect both push and pull factors. Young people have more education, and education is a prerequisite for most nonfarm wage work. Self-employment requires capital and know-how, both of which youth are less likely to have (Filmer and Fox, 2014). Thus, once youth enter the labour force, they are both pulled into wage employment and, to some extent, excluded from self-employment.

The share of wage employment in that total rises from about a third in hinterland and intermediate to a half in peri-urban areas and nearly two-thirds in urban areas, but regional patterns vary considerably. Wage employment overall is less developed in Africa compared with Asia and LAC, and the low share of AFS wage employment in Africa reflects this. Specifically, for all ages

and all zones taken together, there is a sharp drop from Asia and LAC (12 and 13 per cent) to Africa (5 per cent). By contrast, AFS self-employment rises sharply from Asia and LAC (8-9 per cent) to Africa (20 per cent). This inter-regional pattern is similar in all the zones.

Reliance on AFS wage employment compared with self-employment is correlated with overall development of a zone or region. This was presaged in Reardon et al. (2001) for LAC and Bhalla (1997) for India, and at a global scale over nations (Fox and Kaul, 2018). The explanation is that with development comes infrastructure, capital accumulation, and the formation of larger denser markets which encourage new firm entry and hiring of wage workers. By contrast, more hinterland, poorer areas rely more on low-capital and low-productivity self-employment for a longer period of time.

In sum, we find that the share of AFS in total employment rises as one moves from the hinterland to the city because of more wage employment opportunities. Youth employment patterns show significant participation in AFS wage labour, and there is a significant presence of AFS self-employment in Africa.

3.2.3. Non-AFS wage- and self-employment

Globally, non-AFS employment (wage- plus self-) is the largest share of employment and it rises in more urban zones, with about 26 per cent of FTEs in the hinterland, 40 per cent in the intermediate zone, 50 per cent in the peri-urban areas, and 71 per cent in urban areas. Non-AFS shares are around twice those of AFS shares in all zones but the hinterland, where they are close. The share of wage employment in the non-AFS total rises from about half in the hinterland and intermediate zones to nearly two-thirds in peri-urban and urban areas. Both the AFS and non-AFS results confirm the importance of wage work, especially in urban areas and in richer regions.

Globally, there is a strong reliance of youth on non-AFS wage employment in the peri-urban and urban areas. Controlling for zone, non-AFS wage employment traces an inverted U from adolescents to older adults. As with AFS wage jobs, in the peri-urban and urban zones, youths depend 2-3 times more on non-AFS wage employment than in the hinterland and intermediate zones.

Regionally, the share of non-AFS wage employment drops sharply from Asia and LAC (34 and 52 per cent) to Africa (20 per cent). Interestingly, the ratio of Asia and LAC to Africa in the non-AFS wage share is about the same as for the AFS wage share. These findings parallel the aforementioned global trends of wage employment in the description of AFS wage employment patterns.

Moreover, the shares of non-AFS wage work in the hinterland and intermediate zones of Asia and LAC are 2-3 times higher than in those zones in Africa. However, that inter-regional gap greatly narrows for peri-urban and urban areas. As with AFS wage employment, the upshot is that non-AFS wage employment is less developed in Africa compared with Asia and LAC, and the difference is most telling in hinterland and intermediate zones.

Non-AFS self-employment is only about half of that of non-AFS wage work. Of those in non-AFS self-employment, there is an inverted U curve over age groups (just as we saw in AFS wage employment). In the hinterland zone of Africa, the share rises from adolescents to older adults. As with AFS wage jobs, these patterns suggest that non-AFS wage jobs are less plentiful for African youths compared with their counterparts in Asia and LAC, especially in the hinterland.

In sum, in total non-AFS employment, the share in wage work is twice that of self-employment in Asia and LAC, but roughly equal in the case of Africa; this is similar to the AFS results.

4. Modelling the labour supply of individuals

4.1 Theoretical framework

The theoretical framework for the labour supply model derives from the basic agricultural household model (Singh, Squire, and Strauss 1986). In general form this applies to both rural households typically operating some farm land as well as urban households, as a special case, typically with no farm land. Given the heterogeneity of countries we study (in which it is highly unlikely that all relevant markets are complete), we assume a non-separable model in which household production decisions are not separable from household preferences. That is, production decisions are functions of not only input and output prices, technology, and household assets, but also of individual and household characteristics.

Following Singh, Squire and Strauss (1986), under separability, the household is assumed to maximize its utility subject to a full income constraint:

$$\max_{X_a, X_m, X_l, L} U(X_a, X_m, X_l) \text{ subject to } p_a X_a + p_m X_m + w X_l = p_a Q(L, \bar{A}) - wL + wT \qquad (1)$$

where X_a is consumption of the agricultural good (also produced by the household), X_m is consumption of the market good, X_l is consumption of leisure, L is total labour supply in the agricultural production, p_a is the price of agricultural good a, p_m is the price of market good m, w is the wage, $Q(L, \bar{A})$ is output given technology $Q()$, labour input L, and exogenous household land $\bar{A}$, and T is the household's total endowment of time.

In a world characterized by incomplete markets for some inputs and outputs, the household faces a shadow price for labour, endogenous to the household, which is a function of both preferences (e.g., age and education level, and the size of the household) and technology (Singh, Squire, and Strauss, 1986).

Benjamin (1992) lays out a non-separable model of labour demand from and supply to own-farming by an agricultural household, and the supply of labour to non-agricultural activities by that same household. The solution to the constrained utility maximization problem outlined above results in the following heuristic labour demand and supply equations. Demand for (and supply of) household labour to the farm is given by

$$L^{D\_On} = L^{S\_On} = F(w^*, M^*; \boldsymbol{a}) \qquad (2)$$
$$= F(w, p_a, \bar{A}; \boldsymbol{a})$$

where w^* is the shadow wage for the household (which itself is a function of the market wage w and household characteristics $\boldsymbol{a}$), M^* is full income (a function of p_a, $\bar{A}$, and technology Q) evaluated at w^*, and $\boldsymbol{a}$ is a vector of household characteristics. Supply of household off-farm labour is a function of the same variables:

$$L^{S\_Off} = F(w^*, M^*; \boldsymbol{a}) \qquad (3)$$
$$= F(w, p_a, \bar{A}; \boldsymbol{a})$$

4.2 Specification of econometric model

We apply the general form equations of on-farm and off-farm labour from the theoretical framework to each of our dependent variables that represent labour supply: LFP and FTEs of labour for each of the six labour categories. LFP is represented with a dummy variable equal to one if an individual participated in the labour market during the past year, zero otherwise. The FTE variables are the individual's FTEs in each of the six sector categories, which are continuous variables with a lower bound of zero.

We do not include an explicit off-farm wage rate (w) because we lack data on the net income per day for the various off-farm activities, and expect a great deal of heterogeneity of wages across countries. Instead of an off-farm wage as a determinant, we proxy it with spatial variables that are expected to condition the demand for and returns to off-farm labour:

(a) population density zones (urban, peri-urban, and intermediate, with hinterland as the base category, and corresponding shares of the data: 29%, 32%, 21%, 19%) as wages, social support, the quantity and the variety of jobs vary by zone;

(b) the level of the agricultural potential (high and medium, with low as the base category, each representing one third of the sample) that would condition both the return to farm wage work off-farm and the demand for labour in production and consumption linkages with farming;[vi]

(c) travel time to the centre of the nearest urban area (average near 45 minutes) that affects labour's capacity to reach employment opportunities;

(d) country dummy variables (with Niger as the base category) reflecting overall development and thus demand for off-farm labour.

We analyse individual level data and therefore expand the theoretical framework to include both individual and household demographics ($\bar{A}$, $\boldsymbol{a}$) that determine the shadow wage for own-labour.

We include the following individual level dummy variables: age groups (ages 15-17, 18-24, 25-34, leaving ages 35-64 as the base category, and representing shares of the data: 10%, 19%, 24%, 46%), female (52%), in school (13%), completed primary school (65%), completed secondary school (47%), and for being a married male (27%) or a married female (32%). Age groups control for varying incentives and capacities of individuals in varying life stages. The variable for female controls for gender discrimination and differences in expectations to engage in types of labour. Time allocated towards being in school limits one's capacity to work at that time. The completion of primary school and secondary school both increase human capital, increasing capacity to work. Being married could increase or decrease one's incentive to work, depending on spousal income, and it could increase one's capacity to work as household responsibilities could be lessened with home labour being allocated according to comparative advantage.

The household variables include the dependency ratio (averaging 33%) which is calculated as the share of household members younger than age 15 or older than age 64, and dummy variables for receiving remittances (29%) and for owning farm land (42%). Dependency ratio proxies for both incentive and capacity as dependents increase one's need to earn income and limit one's time to work. Receiving remittances affects the incentive to work as they increase non-labour income. Owning land increases one's capacity to engage in farm labour, and proxies for one's existing wealth and therefore the incentive to work.

Our model excludes dependents, individuals below age 15 or above age 64, to highlight the labour choices of working age adults.

4.3 Estimation method

We use a probit model with LFP as the dependent variable to estimate the independent variables' marginal effects on the likelihood that an individual would make the discrete choice to participate in employment. We use a tobit model with FTEs for each of the six employment categories as the dependent variables to account for the clustering of zeros due to the lower bounded nature of the labour category variables.

To account for the potential selection bias caused by the two-step decision making process of LFP and the amount of one's FTEs in an occupational sector, we use a two-stage model with a probit estimation of LFP as the first stage and a tobit estimation of FTE per employment category as the second stage (Heckman, 1979).We use the control function approach, where we include an instrumental variable (IV) in the LFP equation and an estimated inverse mills ratio (IMR) in the second stage equations.

Our IV is observed employment density, which is the share of observations within an enumeration area (or local administrative unit) that are employed, divided by the total observations within the enumeration area, excluding the observation for which the share is calculated. This IV proxies for the additional incentive to participate in employment as individuals see others work, and it proxies for capacity as it signals available employment opportunities. Our exclusion restriction relies on the observation that upon controlling for other spatial, household, and individual factors, the observed density of general employment should not influence one's decision to participate in a particular employment category except through its effect on LFP.

The two stage model is represented by the following equations:

$$LFP_i = \beta_0 + \boldsymbol{\beta_1 S_i} + \boldsymbol{\beta_2 I_i} + \boldsymbol{\beta_3 H_i} + \beta_4 D_i + \varepsilon_i^1 \quad (4)$$

$$FTE_{ic} = \gamma_{0c} + \boldsymbol{\gamma_{1c} S_i} + \boldsymbol{\gamma_{2c} I_i} + \boldsymbol{\gamma_{3c} H_i} + \gamma_{4c}\hat{\lambda}_i + \varepsilon_{ic}^2 \quad (5)$$

where LFP_i is a dummy variable equal to one if individual *i* has worked positive hours during the year before the survey, FTE_{ic} are the FTEs of individual *i*'s participation in each of the six sector categories, $\boldsymbol{S_i}$ represents the spatial variables, $\boldsymbol{I_i}$ represents the individual variables, $\boldsymbol{H_i}$ represents the household variables, D_i is the observed employment density, and $\hat{\lambda}_i$ is the IMR found in equation 5 that is estimated with the estimated coefficients ($\boldsymbol{\beta}$) in equation 4 for each individual *i*.

Testing the validity of the IV in the first stage regressions resulted in chi squared values of 19.6, 30.4, and 18.0 respectively for the full sample, male sample, and female sample. These values are greater than the recommended value of 10 (Staiger and Stock, 1997).

Table 4 presents statistics on the observations of the explanatory variables for the overall, male only, and female only samples. Males have a 50 per cent higher chance of being employed. Among the sample of males and females, males have twice the FTEs (work twice the hours) of females for: own-farming, AFS wage work, non-AFS wage-work, and non-AFS self-employment. By contrast, for farm wage FTEs, males have six times that of females; but for AFS self-employment, males and females are about equal (reinforcing the greater reliance females have on this compared to males).

5. Regressions Findings

The two-step regression results are presented in Tables 5a, 5b and 5c, respectively, for the whole sample, for males only, and females only. We first discuss the effects of key variables on LFP and then move to sectoral FTE results grouped by farm, wage and self-employment categories.

5.1. Spatial effects defined by population density

First, spatial zones, relative to the intercept rural hinterland, affect participation in employment, but primarily for males. As seen in the first column of Table 5a, participation is 2-3 per cent lower in peri-urban and intermediate zones; the difference is statistically insignificant in urban zones. In the males-only regression (Table 5b) the marginal effects are all significant at 3-4 per cent lower than the hinterland. But in the 'females only' regression (Table 5c), none of the zone effects is significant.

Second, most zone effects are significant in the time allocation (occupational choice) regressions, although the effects tend to be weaker for women. Not surprisingly, the effect of 'urban' is sharply negative on own-farm and farm wage FTEs. The negative effect of peri-urban and intermediate zones is respectively half and five times weaker than urban's In the females-only regressions, peri-urban and intermediate zones have a significant but far weaker dampening effect on own-farm FTEs, but an insignificant effect on-farm wage employment (in which women participate far less than males as the descriptive statistics show above).

Third, the effects of urban location on off-farm wage work are strong and positive. Many SMEs that employ labour (Bhalla, 1997) and most large employers, including the public sector, are located in urban areas. The urban effect on AFS wage FTEs is similar to its effect on non-AFS wage work. This suggests that the urban advantage (infrastructure and agglomeration economies) drives firm location decisions in both sectors. Moreover, the peri-urban effect on both of these sectors' wage employment is a third below that of the urban effect. Then the intermediate zone effect is a third again below the peri-urban effect, and shows a drop-off in the statistical significance for AFS wage. This implies that many wage jobs in the AFS sector are concentrated in urban and peri-urban zones, instead of in the intermediate and hinterland areas. The spatial pattern of the correlation between distance to urban areas and employment is consistent with previous rural nonfarm employment literature (Anderson and Leiserson, 1980; Reardon et al., 2007). The zone effects in males-only and females-only regressions mirror the overall effects but the effect for males is slightly stronger magnitude and that of females slightly weaker. This implies that opportunities for wage work for females and males alike are higher in urban and peri-urban areas than in the hinterland.

For off-farm self-employment, the zone effects are similar in their positive and generally increasing magnitudes to that of the zone effects on wage employment, but with several key differences. The urban and peri-urban effects on self-employment in the AFS is less than half as strong as on AFS wage employment, merely a third as strong for females. This makes sense as SMEs and even many relatively large AFS companies are located in urban and peri-urban areas, but much less in intermediate and hinterland areas. By contrast, self-employment tends to be relatively competitive and prevalent in hinterland areas where product competition from big firms and entry barriers are lower, which make them attractive to poorer entrepreneurs. Elbers and Lanjouw (2001) found in Ecuador that wage work is mainly in the peri-urban and urban areas, and self-employment opportunities are mainly in the hinterland, and women tend to head them there.

5.2. Farming potential

First, high and medium agricultural potential zones (relative to low) positively affect LFP, as expected, due to employment induced by production and consumption linkages from agricultural development (Hazell et al. 2007). Interestingly, in gender-specific regressions, this is only significant for females in high agricultural potential zones. This result dovetails with Liverpool-Tasie et al. (2016), who show in Nigeria that women are extensively engaged in off-farm employment in better agricultural potential zones. Reardon et al. (2007) reviewed RNFE surveys and found this correlation in Africa as well as Asian studies. These zones are also where first-stage processing, packing, commerce, and food preparation activities take place that link to a bustling local farm economy, and tend to be low-entry barrier, low investment employment.

Second, controlling for selection into the labour force, the effect of agricultural potential zone has minimal significance on individuals' decisions on how much time to work in different types of employment. There are only small negative effects of the high agricultural potential zone on non-AFS wage labour, small positive effects on own-farming for males of the medium agricultural potential zone and small negative effects of the high agricultural potential zone on female wage labour.

5.3. Youth Labour Force Participation

First, confirming what was observed in the descriptive analysis, the effect of age on LFP is sharply negative for adolescents and moderately negative for older youths. This effect disappears by age 25. The effect is stronger for female adolescents and older youths, suggesting that intense home chores and potentially child bearing play major roles in constraining LFP of young women. Young adult males are more likely to participate than adult males over 35, suggesting a need and ability to provide for a young family, as well the negative effect of advancing age on LFP of males owing to increasing incidence of disability.

Second, although the descriptive analysis shows youth being over-represented in own farming, in the multivariate analysis, where being in school and other factors are controlled for, the youth effect disappears in the overall sample. This suggests that the youth effect seen in the descriptive statistics is mainly selectivity – less educated youths are the ones working on the farm (see below). Being an adolescent female slightly increases the FTEs in own-farm work (relative to older females), whereas there is no significance for adolescent males. This is consistent with the expectation that female adolescents have greater at-home responsibilities than males due to socio-cultural reasons, and it is easier to combine own farm work with these activities. The negative effects of older male youths on FTEs in own-farming coincide with our findings above the young males tend toward wage work off their own farms if their families have them.

Third, regarding farm wage work, only the males-only results show significant effects on FTEs. Being an older youth or young adult male, have positive and strong effects. This might be from a trifecta of lack of ability yet to invest in a farm, being physically strongest at that time, and being driven by the early stage of marriage to supplement income in the cropping season.

Fourth, in both the 18-24 age range and the 25-34 age range, the conditional probability of being in wage work is higher than for adults 35-64. Notably, this effect is stronger for AFS wage work than non-AFS wage work with consistent patterns across gender. Younger people (under 25) in the labour force have no advantage relative to their elders in non-AFS wage work. This highlights that the development of medium or large AFS enterprises that regularly hire labour could strongly

benefit youth needing employment – of both genders, as the marginal effects are significant in the 18-24 age range for both males and females. It may also imply that AFS wage work is transitional work from on-farm labour to non-AFS wage work, although this is impossible to confirm with cross-section analysis such as this.

Fifth, younger people of both genders are less likely to engage in self-employment, either AFS or non-AFS. For males only, the age effects are more than twice as strong for non-AFS as for AFS. By contrast, for females, the effects are similar for AFS and non-AFS self-employment. These results are largely consistent with the explanations given for age patterns in wage work (Filmer and Fox, 2014; ILO, 2017). The effects being stronger for non-AFS suggest that life cycle accumulation (of both skills and capital) is more of a prerequisite for self-employment in the non-AFS sectors.

5.4. Education

First, we note the expected finding that being in school lowers LFP and the FTE levels in all occupational classifications except for own-farm work. These results are particularly strong for women. Being in school has a strong negative effect on LFP, due to scarcity of time. It also has a negative effect on FTEs in all sectors other than own farming and the biggest magnitudes are observed in wage employment. Academic calendars have historically been set so that individuals can participate in own farming, and own farming provides flexibility of schedule that allows for individuals to farm during the hours that they are not in class, in contrast with wage employment that commonly is a full time activity and occurs year round. This finding is similar to that of van den Broeck and Kilic (2019), who find that being enrolled in school has its biggest negative impact on off-farm employment in urban areas where it is dominated by wage jobs. Maloney (2003) found that for the same reason – inflexible schedules – women with children in Latin America are more likely to select into self-employment.

Second, the completion of schooling, either primary or secondary, has little effect on LFP, except for female who complete primary education – findings that also mirror findings in Filmer and Fox (2014), and van den Broeck and Kilic (2019). However, completing school does have strong effects on occupation effects, especially in non-AFS employment. Completion of primary and especially secondary education raises the probability of finding wage work in the non-AFS sectors. Non-AFS includes, beside non-food commerce and manufactures, sectors such as banking and finance, education, health and civil service, all of which have higher educational entry requirements.

Third, the female-only sample shows positive effects of secondary schooling both on AFS and non-AFS wage employment, but not primary school, reflecting the limited access to wage employment that women with less education have (Filmer and Fox, 2014). Due to higher physical strength on average, males have access to more AFS wage opportunities that do not require the completion of education, reducing the significance of male completion of education on this sector.

Fourth, the completion of primary school positively effects the probability of self-employment. The completion of primary school has a positive effect on both male and female FTEs in non-AFS self-employment, while the effect on AFS self-employment is insignificant. Completion of secondary school negatively affects the probability of self-employment. Having a secondary education allows people (females particularly) to wage work, where remuneration tends to be higher and less risky (Filmer and Fox, 2014).

5.5. Other noted effects of control variables

First, the effects of the dependency ratio tell a story of it being a driver of FTEs for jobs that can be done close to home or mixed with home chores, such as own farming and farm wage work. For males, there is an inducement to work as shown with a strongly positive effect on LFP, presumably driven by the role of a 'bread winner' and to create time for the woman to be able to dedicate time to home chores needed with many dependents. For females, higher dependency ratios have positive effects on farm labour and a negative effect on non-AFS wage work, both consistent with the overall effects.

Second, we controlled for a household receiving remittances, but found this to be statistically insignificant. This finding is consistent with that of Haggblade et al. (2010) who showed that remittances are on average a very small share of rural household incomes in most of Africa, Asia, and even Latin America.

Third, the effect of employment density in enumeration areas is much greater in the females-only as in the males-only regression. As we controlled for other factors, this effect may be a socio-cultural condition that reduces transaction costs and increases the social acceptability for women to work outside the home.

6. Conclusions

We contribute to the debate on youth employment by singling out and comparing AFS employment with other employment; while so doing we distinguish wage versus self-employment in the sectoral job categories. Studying AFS employment of youth is important because the rural nonfarm employment literature has been pointing to the ease of access, and the low entry requirements and barriers to entry of AFS jobs in rural areas, which are of potential interest for addressing the pressing need of youth employment. The agrifood systems literature has been pointing to the recent burgeoning of AFS activity as food supply chains grow with galloping urbanization in developing regions. Given that countries go through both an employment transformation (from mostly own-account to wage work) and an AFS transition (from traditional to modern) during rural transformation, understanding where and how much rural youth work is the first step in designing policies and programmes for their inclusion.

Our global analysis of who works where, when and why, using actual hours worked rather than simply participation in sectors, and a population density-based definition of the urban-rural gradient, has yielded new findings relevant to understanding employment opportunities across developing countries. Using the concept of AFS employment, on and off the farm, the role of agricultural transformation in providing employment opportunities in developing countries is once again highlighted, but this time for different age demographics. Our main findings are as follows.

First, from the descriptive analysis, we saw that the standard narrative that the majority of employment in developing countries is in on-farm agriculture is simply not true. We find that on-farm agricultural work accounts for less than 50 per cent of reported hours worked even in Africa overall. However, in the most remote rural areas, on-farm agricultural work still accounts for the majority of hours recorded, even in LAC, where farming is less important as a livelihood.

Second, off-farm work in agriculture value chains (off-farm AFS) is a significant source of employment in all regions. Globally, on-farm work plus off-farm AFS employment accounts for about 50 per cent of all hours worked. In the LAC countries in our sample, where on-farm economic activities account for only 14 per cent of total hours recorded, off-farm AFS employment, which depends on agricultural activities, accounts for over 20 per cent of employment hours recorded. This suggests that even as rising agricultural productivity in richer countries sends labour off the farm, and non-AFS sectors begin to dominate employment opportunities, increased value in off-farm AFS subsectors can continue to provide employment opportunities. Spatially, off-farm AFS employment opportunities, especially wage jobs, are mostly found in urban areas, confirming the advantage urban areas have in enterprise development.

Third, controlling for personal characteristics and agricultural potential, occupational choice is strongly related to population density, highlighting the need for policy makers to be cognisant of the rural-urban gradient in the development of labour policies. Wage employment is strongly related to urbanization, especially in the non-AFS sectors (which includes the public sector, located almost exclusively in urban areas). Self-employment is less strongly related to population density, especially in the AFS sectors, indicating opportunities in activities such as input supply and first-stage agroprocessing outside major cities.

Fourth, controlling for location and agricultural potential, youth do not spend more or less working hours in on-farm work than older adults in general and only younger male adults spend less time in own farming (though more for wages on others' farms). Whether this result is because of youth-specific barriers to entry (such as lack of access to land) or because of positive choices to enter other sectors is impossible to tell in our analysis. However, the narrative that youth cannot enter farming is clearly not true globally. Youth are more likely than adults to allocate their labour hours to off-farm AFS wage employment, disputing the narrative that youth cannot get wage jobs. The high share of youth labour allocated towards wage employment versus self-employment implies that promoting education and infrastructure to help youths get wage jobs, rather than youth entrepreneurship per se, may be a more prudent way of addressing rural youth employment challenge. Education is a driver of youth getting wage jobs, especially high school education for girls. Infrastructure investments that spur AFS (and non-AFS) entrepreneurs to invest and hire could work to help youth to get jobs. The final implication of our findings is that policies that help non-farm AFS, help youth to get jobs. This is not a 'forget farming' message, as farming is an obvious component of AFS, and as economies transform the value added in agriculture increases due to AFS transitions. While the share of agriculture in employment and value added decreases as countries develop, the AFS can be expected to employ an important segment of youth during the transition.

[i] Given the 12 month recall period of FTEs, unemployment is not defined.

[ii] National shares of the data: Bangladesh 16%, Cambodia 1%, Ethiopia 9%, Indonesia 28%, Malawi 1%, Mexico 14%, Nepal 3%, Nicaragua 1%, Niger 1%, Nigeria 14%, Peru 4%, Tanzania 4%, and Uganda 4%.

[iii] Shares of data by population density: hinterland 19%, intermediate rural 21%, peri-urban 32%, and urban 29%

[iv] http://www.worldpop.org.uk/

[v] DIVA-GIS is a free computer program for mapping and geographic data analysis (a geographic information system (GIS). For more information see: https://www.diva-gis.org/

[vi] We use the MODIS Enhanced Vegetation Index (EVI) as a proxy for agricultural potential to facilitate global comparisons (Jaafar and Ahmad 2015).

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Tables

Table 1. Data sources and sample sizes

Region/Country	Source	Year	N. of households
Africa			
Ethiopia	Ethiopian Socioeconomic Survey	2015/2016	4,954
Malawi	Fourth Integrated Household Survey	2016/2017	12,447
Niger	Second National Survey on the Living Conditions of Households and Agriculture	2014	3,617
Nigeria	General Household Survey- Panel	2015/2016	4,291
Tanzania	National Panel Survey	2014/2015	3,352
Uganda	The Uganda National Panel Survey	2013/2014	1,561
Latin America and the Caribbean			
Mexico	National Household Income and Expenditure Survey	2016	69,939
Nicaragua	National Household Living Standard Measurement Survey	2014	6,851
Peru	National Household Survey 2016 - Living Conditions and Poverty	2016	35,785
Asia			
Bangladesh	Household Income and Expenditure Survey	2010	12,240
Cambodia	Cambodia Socio-economic Survey	2014	12,090
Indonesia	Indonesia Family Life Survey	2014	15,881
Nepal	Nepal Living Standards Survey	2010	5,988

Table 2. Labour Force Participation Rates

		Global			Asia			LAC			Africa		
		Total	Males	Females	Total	Males	Females	Total	Males	Females	Total	Males	Females
All Ages	Total Sample	65	79	53	58	78	40	68	82	55	75	80	69
	Urban	60	73	48	57	73	42	66	79	55	58	65	52
	Peri-Urban	57	78	38	52	79	28	67	82	54	68	74	63
	Intermediate	73	81	65	69	82	58	69	84	56	75	80	71
	Hinterland	79	88	71	74	83	65	72	87	57	83	89	77
ages 35-64	Total Sample	73	88	59	64	85	45	75	90	62	85	92	79
	Urban	67	83	53	62	79	45	74	89	60	73	84	62
	Peri-Urban	66	89	45	60	88	33	75	90	62	84	90	79
	Intermediate	81	90	73	75	87	64	77	92	63	87	93	82
	Hinterland	84	93	76	78	86	71	79	94	66	88	96	82
ages 25-34	Total Sample	70	87	56	64	87	44	76	91	62	77	84	72
	Urban	69	85	55	66	84	50	77	91	64	62	74	55
	Peri-Urban	61	85	40	56	88	31	76	93	60	69	74	65
	Intermediate	76	87	67	74	91	60	74	92	58	77	84	73
	Hinterland	82	92	74	77	89	66	74	92	58	86	93	80
ages 18-24	Total Sample	55	67	43	47	66	31	57	69	44	64	69	58
	Urban	48	57	39	47	58	36	53	63	44	43	45	40
	Peri-Urban	45	65	28	40	66	19	56	71	42	53	59	46
	Intermediate	63	71	54	60	76	48	61	75	47	64	68	59
	Hinterland	73	82	64	66	78	57	62	80	44	78	83	71
ages 15-17	Total Sample	41	48	33	26	34	18	30	38	21	57	63	50
	Urban	21	26	15	20	26	14	18	24	13	26	30	22
	Peri-Urban	29	38	19	21	31	9	30	38	22	46	53	39
	Intermediate	50	56	44	41	46	37	34	44	24	56	61	50
	Hinterland	66	74	57	51	56	46	48	59	36	73	79	65

Notes: Calculations represent population weighted averages.

Table 3. Shares of Full Time Equivalents

		Total Sample				Hinterland				Intermediate				Peri-Urban				Urban			
		Global	Asia	LAC	Africa	Global	Asia	LAC	Africa	Global	Asia	LAC	Africa	Global	Asia	LAC	Africa	Global	Asia	LAC	Africa
All Ages	Own-farm	20	19	8	34	46	49	32	53	33	40	11	35	18	18	3	26	2	2	0	6
	Farm wage	7	9	6	3	10	12	18	4	7	10	12	3	10	14	6	2	2	2	1	1
	AFS wage	10	12	13	5	4	3	6	4	5	5	11	4	11	12	16	5	16	17	16	11
	Non-AFS wage	34	34	52	20	15	17	24	9	24	24	40	18	32	30	51	25	53	48	64	36
	AFS self	11	9	8	20	13	8	9	18	14	8	12	21	11	8	10	21	10	10	6	20
	Non-AFS self	16	17	12	19	11	12	9	13	16	13	14	20	18	18	12	22	18	20	12	26
ages 35-64	Own-farm	22	23	10	33	49	56	38	52	37	47	14	35	21	23	5	26	3	3	0	7
	Farm wage	7	9	6	2	9	10	16	3	7	10	11	3	11	14	6	2	1	2	1	1
	AFS wage	8	8	11	4	3	2	4	3	4	3	8	3	8	8	12	3	12	13	13	8
	Non-AFS wage	31	29	48	20	13	12	20	10	21	18	35	19	28	25	48	26	49	44	61	32
	AFS self	13	10	10	21	14	8	11	19	15	9	15	21	12	9	13	21	12	12	8	23
	Non-AFS self	19	20	15	20	12	12	10	13	17	13	17	19	20	20	15	23	22	25	16	29
ages 25-34	Own-farm	15	13	5	27	38	38	25	45	26	31	6	28	12	12	2	18	1	2	0	2
	Farm wage	7	9	6	3	11	15	19	4	8	11	13	3	10	12	6	3	2	3	1	1
	AFS wage	13	14	15	6	5	4	8	4	6	6	12	5	14	15	18	7	18	19	17	14
	Non-AFS wage	39	39	58	22	19	22	31	11	28	30	48	19	37	35	57	28	57	51	69	43
	AFS self	11	8	5	21	14	8	8	21	15	8	8	23	10	8	6	22	7	8	4	18
	Non-AFS self	16	16	9	21	13	13	9	15	17	13	12	23	17	17	10	22	15	17	9	22
ages 18-24	Own-farm	19	13	5	41	45	41	21	59	30	28	6	41	14	11	1	35	2	1	0	10
	Farm wage	7	9	8	3	12	13	24	5	8	11	13	4	10	13	7	2	1	2	1	1
	AFS wage	16	20	20	8	7	6	11	5	9	8	18	5	19	20	23	9	24	27	22	16
	Non-AFS wage	40	44	57	18	18	25	32	8	29	38	48	15	39	39	57	21	60	56	70	42
	AFS self	7	5	4	15	10	6	4	13	11	5	7	17	6	4	5	16	5	4	2	14
	Non-AFS self	10	11	6	15	9	8	6	10	14	10	8	18	11	12	6	16	9	10	5	18
ages 15-17	Own-farm	34	18	16	59	62	62	38	71	45	36	15	56	19	12	3	49	3	2	0	17
	Farm wage	9	12	13	3	9	9	25	4	8	14	18	4	12	17	8	1	2	2	1	1
	AFS wage	14	21	22	3	4	4	9	3	5	5	18	2	19	23	30	3	29	33	34	6
	Non-AFS wage	23	34	35	7	7	13	15	3	16	28	30	7	28	34	41	6	46	47	53	28
	AFS self	10	6	7	16	9	5	6	11	14	8	12	17	9	4	9	23	9	7	6	22
	Non-AFS self	10	9	6	13	8	7	5	9	12	8	7	14	11	10	9	18	11	9	6	27

Notes: Calculations represent population weighted averages.

Table 4. Dependent variables in the regression analysis

\	Percentage Labour Force Participation	
Total	Male	Female
65.4	79.1	52.6

	Average Levels of Full Time Equivalents		
	Total	Male	Female
Own-farm	0.11	0.15	0.07
Farm wage-	0.04	0.06	0.01
AFS wage-	0.06	0.08	0.04
Non-AFS wage-	0.19	0.27	0.11
AFS self-	0.06	0.06	0.07
Non-AFS self-	0.09	0.12	0.06
Total	0.55	0.74	0.36

Table 5a. Regression analysis - Probit on Labour Force Participation and Tobit on Full Time Equivalents

		Full Time Equivalents by Occupation Type					
VARIABLES	Labour Force Participation	Own Farm	Farm wage	AFS wage	Non-AFS Wage	AFS Self-employment	Non-AFS Self-employment
Location - Urban	-0.020	-0.110***	-0.072***	0.221**	0.259***	0.065**	0.144**
Location - Peri-Urban	-0.034**	-0.048***	-0.022*	0.158**	0.180***	0.064***	0.114***
Location - Intermediate Rural	-0.017**	-0.019*	-0.010	0.091	0.121***	0.043***	0.080***
Agricultural potential - High	0.026***	0.029	0.005	-0.006	-0.014*	0.002	-0.010
Agricultural potential - Medium	0.024***	0.025	0.004	0.003	-0.011	-0.002	-0.013
Travel Time to City (log)	0.002	0.001	-0.004	-0.024	-0.022	-0.011	-0.020
Ages 15-17	-0.164***	0.022	0.007	0.047	-0.099**	-0.044***	-0.076***
Ages 18-24	-0.088***	-0.004	0.008	0.080***	0.005	-0.049***	-0.070***
Ages 25-34	-0.002	-0.025***	0.004	0.048***	0.038***	-0.019**	-0.027***
Female	-0.144***	0.001	-0.061**	-0.008	-0.085***	0.079***	-0.010
In School	-0.231***	0.064***	-0.043***	-0.087***	-0.136***	-0.020**	-0.032**
Primary School Completed	0.019	-0.017**	-0.036**	-0.008	0.039**	0.011	0.039***
Secondary School Completed	0.000	-0.062***	-0.035***	0.011	0.130***	-0.030**	-0.013
Married Male	0.162***	-0.000	-0.031***	-0.011	-0.005	0.039***	0.005
Married Female	-0.079**	0.030**	0.004	-0.049***	-0.062***	0.009	0.023***
Dependency Ratio	0.036*	0.009***	0.026***	0.001	-0.032***	0.010	0.008**
Remittances Received	0.011	0.011	0.002	-0.007	-0.012	-0.007	-0.013
Own Land	0.064**	0.135***	-0.023***	-0.049***	-0.082***	-0.025*	-0.044***
Employment Density	0.494***						
Inverse Mills Ratio		-0.284***	-0.092**	-0.094**	-0.101***	-0.090**	-0.131**

Notes: Statistical significance indicated by: *** p<0.01, ** p<0.05, * p<0.1. Country dummy variable marginal effects are located in the appendix.

Table 5b. Regression analysis - Probit on Labour Force Participation and Tobit on Full Time Equivalents (Males Only)

VARIABLES	Labour Force Participation	Full Time Equivalents by Occupation Type					
		Own Farm	Farm wage	AFS wage	Non-AFS Wage	AFS Self-employment	Non-AFS Self-employment
Location - Urban	-0.037***	-0.152***	-0.114***	0.244**	0.302***	0.086*	0.185**
Location - Peri-Urban	-0.036***	-0.077***	-0.046**	0.163**	0.205***	0.073**	0.138**
Location - Intermediate Rural	-0.026***	-0.031**	-0.025**	0.094	0.137***	0.050**	0.102**
Agricultural potential - High	-0.002	0.027	0.015	0.002	-0.013	-0.002	-0.008
Agricultural potential - Medium	0.003	0.025*	0.013	0.007	-0.011	-0.003	-0.012
Travel Time to City (log)	0.001	0.007**	-0.003	-0.028	-0.025*	-0.014	-0.023
Ages 15-17	-0.102***	-0.018	0.001	0.053	-0.110*	-0.038**	-0.106***
Ages 18-24	-0.029	-0.036***	0.015*	0.095***	0.020	-0.041***	-0.094***
Ages 25-34	0.035**	-0.044***	0.014***	0.058***	0.046***	-0.014	-0.034**
In School	-0.255***	0.056*	-0.075***	-0.106***	-0.188***	-0.031***	-0.062***
Primary School Completed	-0.015	-0.017	-0.054**	0.001	0.050***	0.007	0.045***
Secondary School Completed	-0.004	-0.076***	-0.044***	0.009	0.132***	-0.019	-0.013
Married	0.124***	0.007	-0.008	-0.003	0.003	0.036***	0.012
Dependency Ratio	0.119***	0.000	0.036***	0.011	0.001	0.009	0.015
Remittances Received	0.020	0.017	0.004	-0.011	-0.014	-0.010	-0.020
Own Land	0.062**	0.206***	-0.025***	-0.064***	-0.122***	-0.016	-0.044***
Employment Density	0.336***						
Inverse Mills Ratio		-0.255***	-0.058	-0.106*	-0.165**	-0.065**	-0.114**

Notes: Statistical significance indicated by: *** p<0.01, ** p<0.05, * p<0.1. Country dummy variable marginal effects are located in the appendix.

Table 5c. Regression analysis - Probit on Labour Force Participation and Tobit on Full Time Equivalents (Females Only)

VARIABLES	Labour Force Participation	Full Time Equivalents by Occupation Type					
		Own Farm	Farm wage	AFS wage	Non-AFS Wage	AFS Self-employment	Non-AFS Self-employment
Location - Urban	-0.003	-0.072***	-0.036***	0.208**	0.234***	0.046***	0.092**
Location - Peri-Urban	-0.034	-0.028***	-0.005	0.168**	0.176***	0.053***	0.080***
Location - Intermediate Rural	-0.009	-0.012*	-0.001	0.095	0.121**	0.035***	0.052***
Agricultural potential - High	0.049*	0.034	-0.005	-0.015**	-0.018**	0.006	-0.006
Agricultural potential - Medium	0.045	0.029	-0.002	-0.004	-0.016	-0.001	-0.008
Travel Time to City (log)	0.004	-0.002	-0.003	-0.021	-0.020	-0.007	-0.014
Ages 15-17	-0.227***	0.031**	0.005	0.054	-0.078**	-0.050***	-0.059***
Ages 18-24	-0.138***	0.006	0.002	0.076***	0.002	-0.054***	-0.052***
Ages 25-34	-0.024	-0.011**	-0.001	0.040***	0.034***	-0.023***	-0.017***
In School	-0.168***	0.030***	-0.022**	-0.069***	-0.078***	-0.029***	-0.026***
Primary School Completed	0.042*	-0.015***	-0.017**	-0.022	0.027	0.011	0.027***
Secondary School Completed	0.007	-0.047***	-0.020***	0.016**	0.131***	-0.036**	-0.011*
Married	-0.061**	0.019***	-0.012**	-0.049***	-0.065***	0.014**	0.012*
Dependency Ratio	-0.036	0.015**	0.018***	-0.010	-0.066***	0.017	0.004
Remittances Received	0.005	0.009	0.001	-0.003	-0.009	-0.003	-0.004
Own Land	0.059**	0.078***	-0.015**	-0.038***	-0.053***	-0.027*	-0.032**
Employment Density	0.569***						
Inverse Mills Ratio		-0.195***	-0.050**	-0.094**	-0.104***	-0.072***	-0.071***

Notes: Statistical significance indicated by: *** p<0.01, ** p<0.05, * p<0.1. Country dummy variable marginal effects are located in the appendix.

Appendix:

Table A5a. Regression analysis - Probit on Labour Force Participation and Tobit on Full Time Equivalents (Country Variables)

VARIABLES	Labour Force Participation	Full Time Equivalents by Occupation Type					
		Own Farm	Farm wage	AFS wage	Non-AFS Wage	AFS Self-employment	Non-AFS Self-employment
Bangladesh	-0.074***	0.150***	1.106***	0.963***	0.552***	-0.048**	0.092*
Cambodia	0.073***	-0.059**	0.092***	-0.103***	0.260***	-0.142***	-0.166***
Ethiopia	0.085***	-0.009	0.520***	1.480***	0.704***	0.121***	0.214***
Indonesia	-0.035***	0.153***	1.051***	0.911***	0.404***	0.112***	0.166***
Malawi	0.144***	-0.052***	0.903***	-0.093***	-0.179***	-0.136***	-0.166***
Mexico	0.035	-0.122***	0.310***	0.285***	0.305***	-0.147***	-0.176***
Nepal	0.097***	0.031**	0.832***	0.430***	0.432***	-0.054***	-0.046***
Nicaragua	-0.003	-0.130***	0.057***	-0.124***	0.037*	-0.142***	-0.158***
Nigeria	0.043***	0.161***	0.787***	1.083***	0.522***	0.238***	0.329***
Peru	0.066***	-0.099***	-0.003	-0.092***	0.031**	-0.140***	-0.131***
Tanzania	0.087***	0.005	1.027***	0.966***	0.624***	0.152***	0.241***
Uganda	0.096***	0.022	0.962***	1.057***	0.614***	0.059*	0.063*

Notes: Statistical significance indicated by: *** p<0.01, ** p<0.05, * p<0.1

Table A5b. Regression analysis - Probit on Labour Force Participation and Tobit on Full Time Equivalents (Males Only) (Country Variables)

VARIABLES	Labour Force Participation	Full Time Equivalents by Occupation Type					
		Own Farm	Farm wage	AFS wage	Non-AFS Wage	AFS Self-employment	Non-AFS Self-employment
Bangladesh	0.057***	0.132***	0.985***	0.695***	0.445***	-0.053*	0.032
Cambodia	0.003	-0.062**	0.024	-0.135***	0.184***	-0.151***	-0.211***
Ethiopia	-0.007	0.023	0.492***	1.233***	0.563***	0.124***	0.115***
Indonesia	-0.067*	0.208***	0.993***	0.687***	0.339***	0.086***	0.072
Malawi	0.034*	-0.054***	0.925***	-0.122***	-0.242***	-0.146***	-0.208***
Mexico	0.054***	-0.152***	0.413***	0.144***	0.307***	-0.164***	-0.232***
Nepal	0.015	0.033***	0.691***	0.395***	0.469***	-0.035***	-0.075***
Nicaragua	0.041**	-0.144***	0.149***	-0.158***	-0.019	-0.150***	-0.207***
Nigeria	-0.016	0.241***	0.762***	0.826***	0.419***	0.213***	0.240***
Peru	0.034**	-0.135***	0.002	-0.146***	0.040*	-0.152***	-0.175***
Tanzania	-0.003	0.015	0.943***	0.781***	0.560***	0.147***	0.160***
Uganda	-0.022	0.046*	0.941***	0.866***	0.511***	0.058**	0.006

Notes: Statistical significance indicated by: *** p<0.01, ** p<0.05, * p<0.1

Table A5c. Regression analysis - Probit on Labour Force Participation and Tobit on Full Time Equivalents (Females Only) (Country Variables)

VARIABLES	Labour Force Participation	Full Time Equivalents by Occupation Type					
		Own Farm	Farm wage	AFS wage	Non-AFS Wage	AFS Self-employment	Non-AFS Self-employment
Bangladesh	-0.280***	0.131	2.349***	2.012***	1.135***	-0.079***	0.055**
Cambodia	0.107***	-0.044**	1.154***	-0.037***	0.628***	-0.135***	-0.097***
Ethiopia	0.141***	-0.025	1.697**	2.418***	1.266***	0.128***	0.359***
Indonesia	-0.027	0.089**	2.005***	1.713***	0.738***	0.129***	0.262***
Malawi	0.215***	-0.042***	2.175**	-0.022	-0.097***	-0.128***	-0.110***
Mexico	-0.002	-0.086***	0.860***	0.919***	0.552***	-0.125***	-0.109***
Nepal	0.139***	0.028	2.231**	0.704***	0.644***	-0.061***	0.028
Nicaragua	-0.063*	-0.094***	0.046***	-0.078***	0.294***	-0.134***	-0.083***
Nigeria	0.079***	0.084***	1.962***	2.030***	1.006***	0.255***	0.449***
Peru	0.075**	-0.062**	0.452***	0.134***	0.165***	-0.119***	-0.060***
Tanzania	0.141***	-0.002	2.410**	1.787***	1.042***	0.171***	0.385***
Uganda	0.184***	0.001	2.333**	1.850***	1.115***	0.069*	0.171***

Notes: Statistical significance indicated by: *** p<0.01, ** p<0.05, * p<0.1

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