

WIDER Working Paper 2020/110

Income diversification and household welfare in Tanzania 2008–13

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September 2020

In partnership with



This publication results from [Sustainable development solutions for Tanzania – strengthening research to achieve SDGs](#), a collaborative project between the [UONGOZI Institute](#) in Dar es Salaam, Tanzania, and [UNU-WIDER](#) in Helsinki, Finland, with a main research objective of informing the development and implementation of policies aiming for economic transformation and sustainable development in Tanzania and the East African region. With financial support provided by the Ministry for Foreign Affairs of Finland, the joint project launched in 2018 with key questions giving the partners a framework for collaboration and the research work to be undertaken. The project focuses on macroeconomic perspectives, domestic resource mobilization, extractives, industrialization, sustainable livelihoods, and gender as a cross-cutting issue. The project provides local stakeholders a platform for research and policy discussions on Tanzania and bridges these discussions to the regional and international development debate.

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Abstract: This paper uses three waves of Tanzanian National Panel Surveys (2008/09, 2010/11, and 2012/13) to construct a panel from 3,676 households that appear in at least two waves to explore the effect of income diversification on household welfare measured in terms of food consumption. The analysis considers three sources of labour income in addition to farming. Increasing diversification is associated with higher welfare, but there are differences by gender and activity type. Non-agricultural wage employment is clearly beneficial, irrespective of gender, and has had relatively high growth. Non-agricultural self-employment is a welfare-increasing diversification strategy, especially in rural areas (although females benefit more than males in urban areas), but growth has been slow. Agricultural wage employment has been a major source of increased employment for females from poorer rural households but appears to be chosen as the only available option as it is not associated with increasing household consumption.

Key words: income diversification, labour income, gender, household welfare, Tanzania

JEL classification: I39, O12, O55

Acknowledgments: This is a revision of the paper presented at the UONGOZI and UNU-WIDER workshop on ‘Supporting development policies towards sustainable livelihoods, industrialization, and resource mobilization in Tanzania’ in Dar es Salaam in February 2020. We are grateful to participants for helpful comments and to UNU-WIDER and UONGOZI staff for comments on revisions.

The basic structure, measures used, presentation of data, and main methods follow Khan and Morrissey (2019). Unlike that study for Uganda, which covered more surveys over a longer period, this analysis for Tanzania does not include any pseudo-panel estimates nor remittances as a source of income but does include analysis of labour transitions (in section 4.3).

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This study has been prepared within the project [Sustainable development solutions for Tanzania – strengthening research to achieve SDGs](#) funded by the Ministry for Foreign Affairs of Finland.

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Information and requests: publications@wider.unu.edu

ISSN 1798-7237 ISBN 978-92-9256-867-2

<https://doi.org/10.35188/UNU-WIDER/2020/867-2>

Typescript prepared by Mary Lukkonen.

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The Institute is funded through income from an endowment fund with additional contributions to its work programme from Finland, Sweden, and the United Kingdom as well as earmarked contributions for specific projects from a variety of donors.

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The views expressed in this paper are those of the author(s), and do not necessarily reflect the views of the Institute or the United Nations University, nor the programme/project donors.

1 Introduction

Diversified sources of income are an important component of household livelihood strategies in low-income countries (Asfaw et al. 2019; Van den Broeck and Kilic 2019) by increasing total income and spreading risk. Much of the literature addresses engagement of farming households in non-farm activities (e.g., Reardon et al. 2007; Davis et al. 2010; Loison 2015). Davis et al. (2017) document the increasing prevalence of rural household engagement in non-farm employment for a large sample of countries, focusing on Sub-Saharan Africa (SSA). Van den Broeck and Kilic (2019) consider diversification into non-farm employment, but measured at the individual level for self-employment (distinguishing industry and services) or wage (agriculture, industry, and services) employment, for five SSA countries including Tanzania (with only the 2011 and 2013 survey rounds). They focus on documenting gender differences, noting that women are less likely to participate in any type of wage employment: 40 per cent in 2011 and 45 per cent in 2013 compared to 59 per cent for males in both years in Tanzania (p. 85). Furthermore, when females gain any wage employment it is most likely to be casual wage work in agriculture: 48 per cent compared to 38 per cent for males in 2011 but 59 per cent compared to 38 per cent in 2013 (p. 87). Drivers of diversification vary across countries and by gender. Neither of these studies investigate household diversification at a national level or relate diversification to a measure of household welfare. This paper contributes to research on sustainable livelihoods by relating household welfare to the labour activities of members, distinguishing agriculture, informal and formal wage labour, and male from female labour. It also considers dynamics of diversification, the determinants of entry, and continuation in different types of employment by members at the household level.

This paper analyses the diversification of sources of household incomes and the association with household welfare using three waves of the Tanzania National Panel (household) Surveys (TNPS 2008/09, 2010/11, and 2012/13) (NBS 2010, 2011, 2013). Household welfare is measured using consumption of food (including an inputted value for consumption out of own production for farm households) and non-food items per adult equivalent, adjusted for regional and time price variation (including temporal differences associated with the fieldwork as each survey spanned over 12 months)¹. As our focus is on household welfare, and household size is included as a control in the analysis, the adult equivalent measure is more appropriate than per capita consumption. Information about the surveys and construction of the consumption measures can be found in the Tanzania National Bureau of Statistics TNPS report (URT 2011).

In order to assess income diversification at the national level, one needs to ensure the sources of incomes are comparable across both urban and rural households, particularly those with and without a household farm. Household income sources are separated into four labour categories that can be consistently measured at the national level within each wave and can be tracked accurately across waves given the changes in the underlying questionnaires: wage employment or self-employment and agricultural or non-agricultural employment². Agricultural self-employment, or agriculture (farm) income, includes all self-employed activities in agriculture and fisheries for

¹ Consumption is consistent for each wave but not across waves. This could be adjusted as the TNPS reports give inflation rates between the surveys (results are unlikely to change as we include year fixed effects). Future analysis could calculate a basic needs poverty line using data from the reports; the TNPS reports (and our initial analysis) suggest consumption has fallen in real terms since the first wave and poverty slightly increased.

² In their study of Uganda, Khan and Morrissey (2019) included remittances as a source of income diversification given the importance for livelihoods (Wouterse and Taylor 2008). However, the recording of remittances in TNPS is inconsistent and incomplete so this source is omitted.

subsistence or market. Non-agricultural self-employment (NAS) includes all individuals operating a business or engaged in any self-employed activity outside of agriculture. Agricultural wage (AW) employment includes all private and public agricultural employment³, while non-agricultural wage (NAW) employment includes all private and public non-agricultural work. In the first wave, individuals can only list one form of wage employment for the last year while the other waves allow for up to two wage jobs. Consequently, even if an individual has work in two off-farm wage categories, we only include the one reported as the main wage job.

Section 2 provides a brief overview of related literature on diversification. Section 3 discusses the data and how income diversification is measured, with some descriptive statistics of the evolution of relative household welfare over the period of study. Ideally one could identify certain activities as welfare-increasing (associated with higher earnings) and others as welfare-maintaining (low earning opportunities but allow the household to maintain consumption levels). The data are limited, but we do consider the association between engaging in additional activities and household welfare relative to the mean household. Section 4 presents the empirical model and estimates of the relationship between income diversification and household welfare. Three issues are addressed: correlations between types of diversification and household welfare, distinguished by gender and rural or urban; identification of which activities are likely to be welfare-improving; and identification of household characteristics that determine the type of diversification. Section 5 concludes by considering implications for policy.

2 Diversification of sources of income

Existing literature on income diversification tends to have a specific focus, such as increases in non-farm activities in rural areas (e.g. Reardon et al. 2007) or the emergence of household enterprises in urban areas (e.g. Fox and Sohnesen 2012). The large literature on rural households considers either on-farm crop diversification (e.g. McNamara and Weiss 2005) or off-farm opportunities, including agricultural wage and non-farm employment (e.g., Reardon et al. 2007; Davis et al. 2010). Davis et al. (2017) consider patterns of household engagement in agricultural wage, non-agricultural self-employment, and non-agricultural wage for 22 countries, focusing on SSA. For Tanzania, more than half of households get three-quarters of income from farming, and one-third of households are classified as diversified (Davis et al. 2017: 160). They observe that for SSA in general, ‘the share of households specializing in self-employment activities and non-agricultural wage labour increases with expenditures’ (Davis et al. 2017: 163) to infer that off-farm diversification is likely to be welfare-enhancing. However, the analysis is restricted to the primary source of household income for rural households; household welfare is not addressed; and Tanzanian data are only for 2009.

The analysis by Van den Broeck and Kilic (2019) is closely related to our analysis as they use similar categories of off-farm employment for five SSA countries. In the case of Tanzania, they find that women are less likely to participate in off-farm wage employment by at least 10 percentage points, 40–45 per cent versus 59 per cent for men at the national level, and the gap is largest in urban areas (Table 1, p. 85). Females in off-farm employment are more likely than males to be in AW and far less likely to be in NAW, with similar shares in services (Table 2, p. 87). Almost half of women never engage in off-farm employment, compared to about one-third of males (Table 4, p.

³ Public agricultural workers are included as AW rather than NAW because a significant portion of public employment in agriculture included public works programmes rather than only employees of the Ministry of Agriculture, and in practice as there are few public agricultural workers.

90). The analysis is based on individual-level data over 2011–13 and does not relate diversification to a measure of household welfare. In contrast, we analyse diversification at a household level over 2008–13 and relate this to relative household consumption.

Increased opportunities for non-farm employment have the potential to alleviate poverty (Barrett et al. 2001). There is little evidence that rural non-farm employment reduces poverty, as the low-skilled (especially females) cannot access high-paying jobs, although such opportunities may prevent incomes declining further for the poor (Lanjouw 2007). This motivates investigating how income diversification has changed. Asfaw et al. (2019) consider both crop and income diversification for farming households in Malawi, Niger, and Zambia (data for various years between 2010 and 2015) and find that poorest households tend to benefit most from diversification. Although ‘income diversification is a welfare enhancing strategy in all the three countries’, crop diversification has no effect on welfare in Niger and is positive in Malawi but ‘a welfare decreasing strategy in Zambia’ (Asfaw et al. 2019: 286). Thus, our expectation is that households with more sources of income will tend to have higher welfare, and we investigate this for Tanzania.

3 Data and measuring income diversification

The TNPS are part of the series of surveys released by the World Bank for its Living Standards Measurement Study (LSMS-ISA) project. In this paper we use three waves of the panel. The 2008/09 wave started with an initial sample of 3,265 households. Of these, 3,168 households were re-sampled in 2010/11 alongside another 756 new or split-off households, producing a combined sample of 3,924. The 2012/13 wave re-sampled 3,786 households from the previous wave and had a total sample size of 5,010 after including new and split-off households⁴. We exclude households that reported an income diversification (ID) value of 0 (had no farm or off-farm income), and once households with missing data are excluded we have a panel data set of 10,141 observations taken from 3,676 households that appear in at least two waves, of which 2,789 appear in all three waves. Household income sources are separated into four labour categories that can be consistently measured at the national level within each wave and can be tracked accurately across waves given the changes in the underlying questionnaires. The labour activities are wage employment or self-employment and agricultural or non-agricultural employment.

Agricultural self-employment, or agriculture (farm) income, includes all self-employed activities in agriculture and fisheries. Although the surveys contain an agriculture module, to keep the analysis consistent between farming and non-farming households we do not consider the type of farming (cash crops or food crops) or crop diversification as part of our measure, unlike many of the studies focusing on rural household diversification⁵. Non-agricultural self-employment includes all earnings activities for which the individual is not listed as an employee (such as being an own account worker, helping in the household, or being an employer) that is done outside of agriculture.

⁴ The fourth wave (2014/15), in order to ensure representativeness, used a new sampling frame based on the 2012 Population and Housing Census and refreshed most of the household sample. Thus, of the 4,220 households surveyed, only 860 were original households and 3,360 were new. Consequently, at this stage we do not incorporate the fourth wave (or earlier surveys).

⁵ Future analysis could create a new ID variable that sums all the different businesses a household has, the different wage workers they have, and, for farming households, the different types of farming (cash crop, food crop, animal rearing, fishing). This way urban and rural households can have multiple sources of each of the four types of work.

Agricultural wage employment includes all private and public agricultural employment, while non-agricultural wage employment includes all private and public non-agricultural work.

Income diversification can be measured in various ways. If only concerned with two sources, shares are appropriate. For example, a common approach for rural households is to use the non-farm share in total income (Davis et al. 2010). If it is necessary to allow for many sources of income, either because household adults each engage in more than one activity or because activities can be sub-divided (different types of non-farm activity or diversifying crops grown), two approaches are common. One is to construct discrete indicator variables based on numbers of sources or categories of types of income (Abdulai and CroleRees 2001). An alternative is to construct a Herfindahl index measure based on earning shares of multiple sources (Asfaw et al. 2019). Earnings from self-employment (farm or NAS) were recorded at the household level in all waves. However, the way in which earnings from NAS and household enterprises were recorded was changed between the second and third waves, and it would be difficult to calculate farm earnings in a measure consistent with the other income sources. Earnings from wage employment were limited to the primary source of wage employment for each individual in the first wave or the primary and secondary sources in the other two waves. To the extent most individuals earn most of their wage income from their primary source, a Herfindahl index could be created for these income sources at the household level⁶.

Creating a measure of diversification at the individual level using earning shares also proves difficult given the inconsistent way wage earnings are recorded and, more importantly, earnings from self-employment are only available at the household level (given multiple members work on the family farm or business). However, which types of employment (AW, NAS, NAW) each worker engaged in can more reliably be calculated. As such, it is possible to classify each worker in each type of employment as a different source of income. Although two workers in wage jobs are two distinct income sources, this separation is harder to justify for household activities where —employment on household plots or household enterprise is treated as one (family labour) income source. Even when households operate more than one enterprise, these enterprises are often in similar industries and closely related. For agricultural wage employment, incomes of different workers may be linked because of local conditions such as employment on the same neighbouring farms (thus, the work may be temporary and short-term, one reason why earnings are low).

Table 1: Distribution of household income sources, 2008–13

Panel A: Percentage of households with each income source			
	2008/09	2010/11	2012/13
N	3,265	3,924	5,010
Farm income	85	80	78
Off-farm work	64	74	75
- NA self	41	45	44
- Wage	38	49	51
- Non-agri	23	32	32
- Agri	17	20	22

⁶ In principle, it would be possible to create a measure of earning shares from each of the four types of employment, but we leave this as a potential future extension.

Panel B: Average number of workers in households			
Off-farm work	0.92	1.14	1.21
- NA self	0.51	0.57	0.61
- Wage	0.50	0.69	0.73
- Non-agri	0.27	0.40	0.39
- Agri	0.23	0.30	0.34
Potential workers	2.86	2.88	2.78
Panel C: Average income diversification count score			
ID	1.87	2.06	2.06
ID off-farm	1.02	1.26	1.28
Panel D: Composition of off-farm workers in households			
Male (%)	47.3	55.3	56.4
Male (#)	0.53	0.65	0.66
Female (%)	35.3	42.8	47.4
Female (#)	0.39	0.50	0.55
Non-head (%)	32.0	38.4	41.3
Non-head (#)	0.39	0.52	0.56

Note: population weighted using survey weights; N is number of households. 'Potential workers' shows the average number of working-age adults (15 years or above) per household. 'NA self' is non-agricultural self-employment; ID is income diversification; ID off-farm is a count of how many of the three types of off-farm work the household engages in (includes agricultural wage labour); # refers to the average number of such workers across all households; % refers to the percentage of households containing at least one such worker.

Source: authors' calculations based on Tanzania National Panel Surveys (NBS 2010, 2011, 2013).

We measure diversification as a simple count of how many of the four different income sources households received. The simplicity of count assures consistency across waves given the different underlying questionnaires. We acknowledge the weakness that this does not account for how much each activity contributes to overall incomes; for households engaged in multiple activities, those where almost all income is from one or two activities are less diversified than households with the same count but shares spread fairly evenly across activities. However, the count is indicative, mainly used for descriptive analysis, and we focus on analysis for types of activities. Table 1 shows the changing income sources for members of households (all percentages use survey weights). Panel A highlights the rise in the relative importance of off-farm work (especially NAW) and the decline in importance of farm incomes. Note that shares need not add up to 100 per cent or sub-components as households can have members in more than one activity. The most pronounced relative increases have been for the share of households with a member engaged in NAW (from 23 to 32 per cent)⁷ and AW (17 to 22 per cent);⁸ NAS increased slightly from 41 to 44 per cent so most of the growth in off-farm labour was in wage employment. There has been a decline from 85 to 78 per cent in the proportion of households relying on farm income.

⁷ For convenience throughout, we refer to 2008/09 as 2008, 2010/11 as 2010, and 2012/13 as 2013.

⁸ Some caution in the shares is warranted as the classification of wage workers is based on whether their main wage job is NAW or AW (however, it appears that fewer than 10 per cent of wage workers had two wage jobs).

Panel B shows the average number of workers (those aged 15 and over) per household in each type of employment. Household size in terms of potential workers (adults) is quite stable with a very small decline. The average number of wage workers increased by almost half—NAW from 0.27 to 0.39 and AW from 0.23 to 0.34—while the average number of NAS increased from 0.51 to 0.61. In relative terms, the fastest growth was in AW employment, by 47 per cent compared to 44 per cent for NAW (with growth in the latter levelling off between 2010 and 2013); NAS increased by 20%; and the average number of off-farm workers increased by 31 per cent. By 2013, there are on average almost as many workers earning AW as NAW even though the number of households with any NAW was about 50 per cent higher than AW, suggesting households with AW workers have multiple members engaged in such activity. For the same year, compared to NAW there were about 50 per cent more workers engaged in NAS (whereas in 2008 there were about twice as many engaged in NAS as either NAW or AW). This suggests significant growth in wage employment over a relatively short (5-year) period.

Panel C of Table 1 shows how all these shifts in the sources of income affected the count measure of ID. Although the overall increase in ID appears small, it compares favourably with Uganda between 2005 and 2012 (Khan and Morrissey 2019). Average ID increased from 1.87 to 2.06 in Tanzania compared to a decline from 1.72 to 1.66 in Uganda, while the off-farm increase from 1.02 to 1.28 compares to a stable 0.9 in Uganda. Furthermore, the increase in ID mask compositional changes where the fall in farm income has been offset by rises in off-farm, particularly wage, employment. Panel D shows that there has been sustained growth in both male and female off-farm employment over the 5-year period; the growth is relatively more pronounced for females (especially for AW, Table 2), and the percentage that are not the household head has increased by 29 per cent. Female off-farm participation increased by 41 per cent compared to 24 per cent for males, closing the participation gap. Consequently, by 2013 almost half of all households have at least one female off-farm worker compared to around one-third in 2008.

Table 2 shows differences between rural and urban areas. Over 90 per cent of rural households remained engaged in farming (Panel A), with a five-percentage-point decline (Davis et al. 2017), showing a similar pattern in eight other African countries. The proportion of urban households engaged in farming declined but remained over 40 per cent. Off-farm employment involves a much larger share of urban (over 90 per cent) than rural (under 70 per cent) households but has grown much faster in rural areas. Over half of urban households gain NAW income compared to about one-fifth in rural areas, although NAW has grown by about one-third in rural areas compared to 15 per cent in urban areas. Unsurprisingly, AW is very low in urban areas (but increased to 7 per cent of households) and increased by 38 per cent in rural areas to a share of 29 per cent of households, remaining the more common form of wage employment in such areas. The share of households with NAS changed only slightly, remaining around 60 per cent in urban areas and increasing to almost 40 per cent in rural areas. The steady increase in wage employment over the 5-year period has resulted in wage employment becoming more prevalent than NAS in both urban and rural locations.

Table 2: Rural-urban and gender distribution of income sources, 2008–13

Panel A: Percentage of households with each income source						
	Rural			Urban		
	2008/09	2010/11	2012/13	2008/09	2010/11	2012/13
Population %	74	69	68	26	31	32
N	2,063	2,629	3,219	1,202	1,295	1,791
Farm income	99	95	94	47	45	42
Off-farm work	55	66	68	87	92	92
- NA self	35	38	38	59	60	58
- Wage	34	45	47	51	60	60
- Non-agri	14	21	21	47	55	54
- Agri	21	26	29	4	5	7
Panel B: Average number of workers per household						
Off-farm work	0.79	1.03	1.09	1.27	1.40	1.46
- NA self	0.42	0.48	0.52	0.76	0.76	0.82
- Wage	0.46	0.65	0.71	0.60	0.77	0.78
- Non-agri	0.17	0.25	0.25	0.56	0.71	0.68
- Agri	0.29	0.40	0.46	0.04	0.06	0.09
Potential workers	2.87	2.94	2.84	2.82	2.75	2.65
Panel C: Average income diversification count score						
ID	1.81	1.99	2.01	2.03	2.20	2.15
ID off-farm	0.83	1.04	1.06	1.57	1.75	1.73
Panel D: Average number of male workers per household						
Off-farm work	0.47	0.60	0.60	0.72	0.77	0.80
- NA self	0.22	0.24	0.24	0.36	0.34	0.37
- Wage	0.30	0.42	0.42	0.42	0.52	0.51
- Non-agri	0.13	0.19	0.19	0.40	0.49	0.46
- Agri	0.17	0.24	0.23	0.02	0.03	0.05
Potential workers	1.38	1.42	1.37	1.30	1.26	1.22
Panel E: Average number of female workers per household						
Off-farm work	0.33	0.43	0.50	0.55	0.63	0.66
- NA self	0.21	0.25	0.28	0.41	0.42	0.44
- Wage	0.16	0.23	0.29	0.18	0.25	0.27
- Non-agri	0.03	0.07	0.06	0.16	0.22	0.22
- Agri	0.12	0.16	0.23	0.02	0.03	0.05
Potential workers	1.49	1.51	1.46	1.48	1.45	1.39

Note: as for Table 1, based on all households (including farming), population weighted using survey weights. '%' refers to the percentage of households containing at least one member of each type. 'Average' is the average number across all households. Percentages in Panel A need not add up as households can have multiple activities.

Source: authors' calculations based on Tanzania National Panel Surveys (NBS 2010, 2011, 2013).

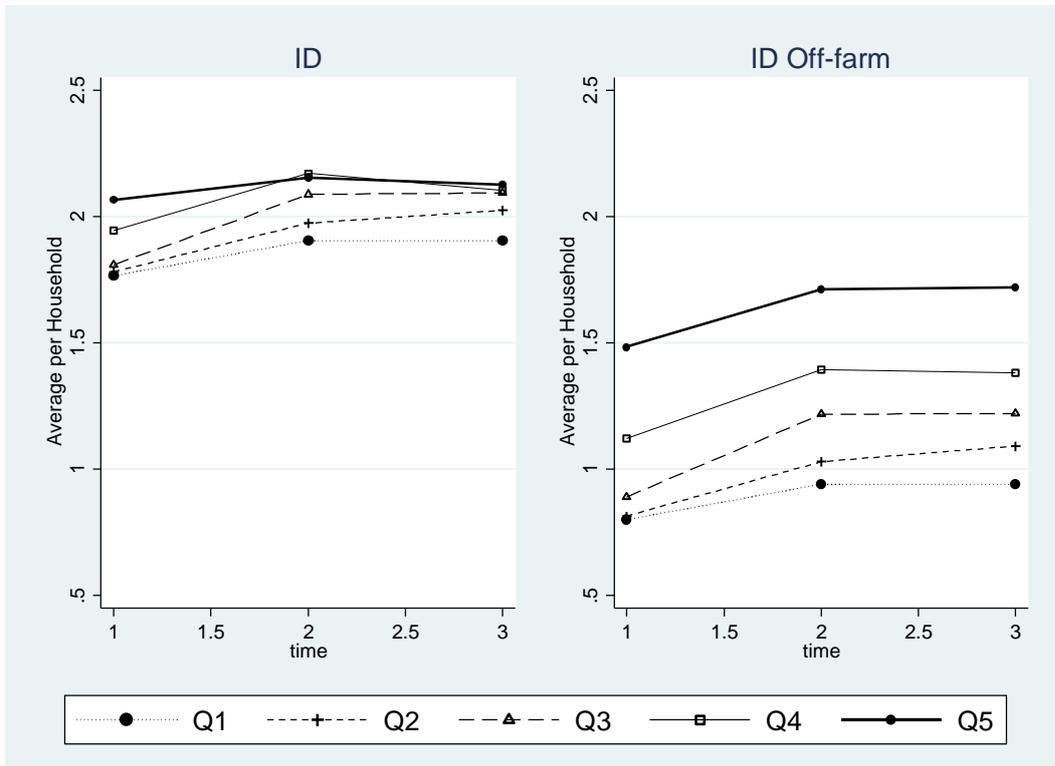
Panel B shows that the average number of wage workers has increased significantly in rural and urban households (although the AW number is very low in urban areas). The growth rates in the average number of off-farm workers in rural households have been over twice the rates for urban households (except AW, which more than doubled in urban areas but only to an average of 0.09, compared to a 58 per cent increase to 0.46 workers in rural households). The average number of NAW workers in rural households increased by almost half (and one-fifth for urban) while NAS increased by over one-fifth (less than one-tenth for urban). This suggests some dynamism in rural employment. Panel C shows that both urban and rural households have on average two of the four income sources, and rural households are less diversified than their urban counterparts for off-farm jobs. The average off-farm ID for rural households rose by 28 per cent (to 1.06), although it is still well below the level for urban households (which increased by 10 per cent to 1.73)⁹. Much of the increase in diversification came during the first two waves.

Panel D shows that the average number of male off-farm workers in rural households increased by 28 per cent to 0.60; more than one-third of this in 2013 is NAS (grew by 10 per cent), AW is over one-third (and increased by one-third), and NAW is less than one-third (increased by half). In urban households the increase was about 10 per cent to 0.80 (most of the increase was NAW to 0.46). The fastest growth in female off-farm employment has been in rural areas (Panel E), where the average number increased by 50 per cent to 0.50 (and AW almost doubled). In rural areas, women have come to be predominant in NAS and equal the number of men engaged in AW, but participation in NAW still remains far lower. The average number of female off-farm workers in urban households is higher than in rural but only increased by 10 per cent to 0.66 (about half the growth was NAW, which accounts for about one-third of the total, with most of the rest in NAS). Overall, although off-farm employment grew faster in rural areas it remains more widespread in urban areas, particularly non-agricultural activities.

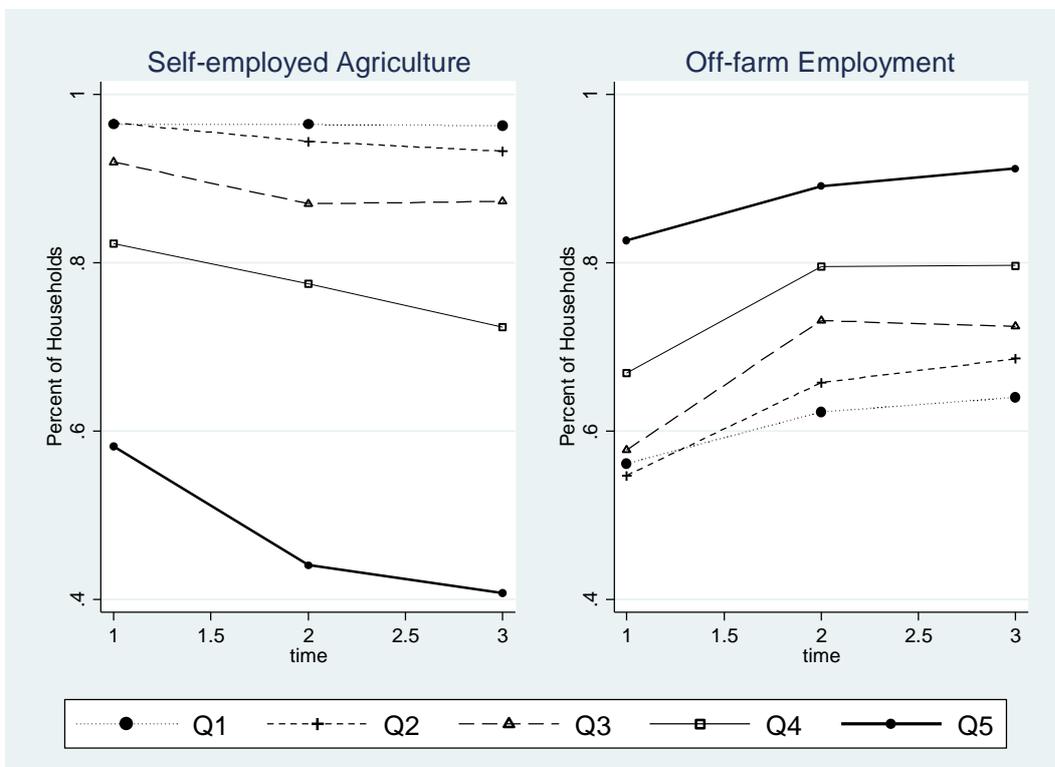
⁹ These levels are both considerably higher than the corresponding averages for Uganda found by Khan and Morrissey (2019).

Figure 1: Income sources by household consumption quintiles

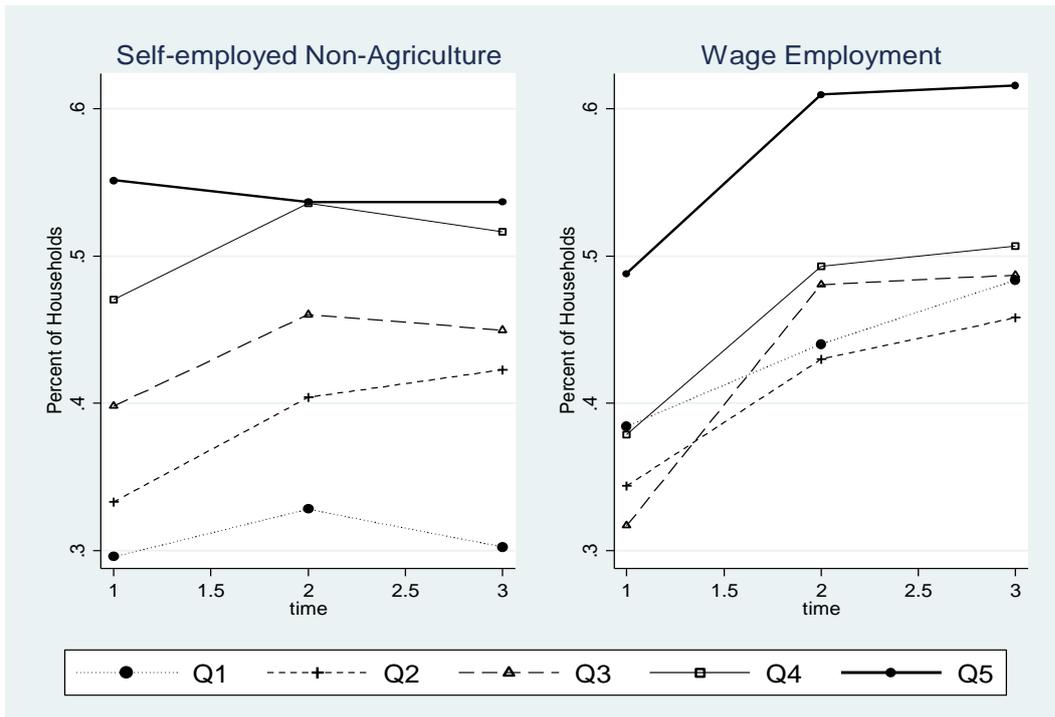
A) Consumption quintiles and income diversification



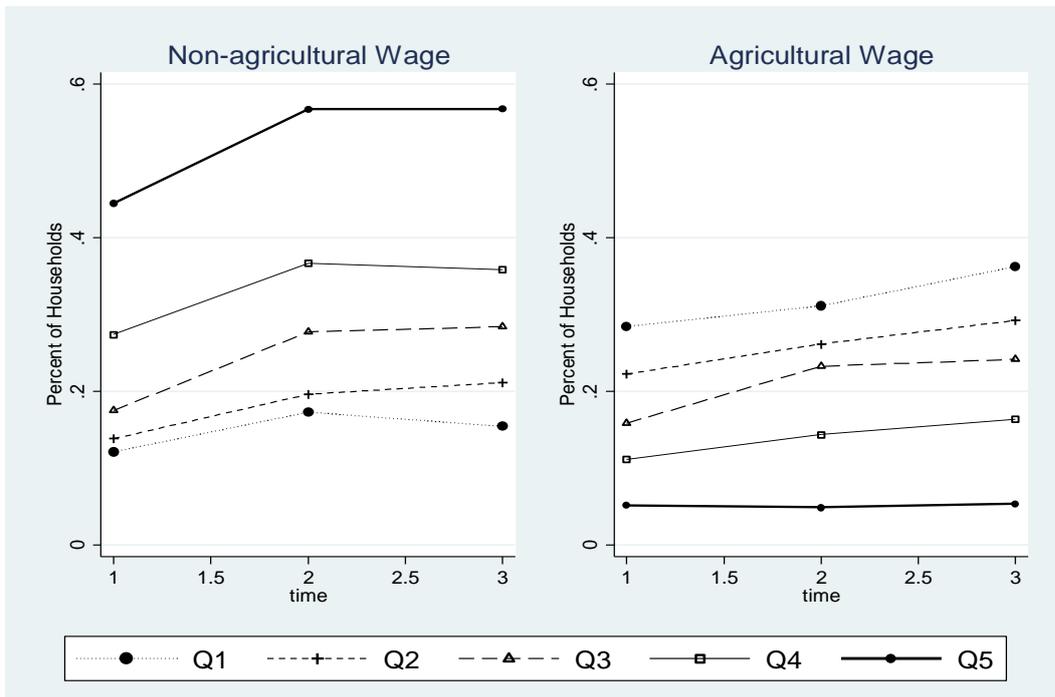
B) Consumption quintiles, farm and off-farm



C) Consumption quintiles and employment



D) Consumption quintiles and wage employment



Source: authors' calculations based on Tanzania National Panel Surveys (NBS 2010, 2011, 2013).

Figure 1 illustrates how income sources differ by quintiles of adult equivalent consumption. Figure 1A shows the pattern for ID: A farm is included, and the differences across quintiles are small, although richer quintiles are more diversified. The differences are greater for off-farm ID, where only the richest (Q5) has an average ID above 1.5 and only the poorest (Q1) is below 1.0. Diversification increased for all quintiles, with almost the whole increase being between 2008 and

2010. The increase was more for richer quintiles that also had higher values of ID. Figure 1B compares the percentage of households with farm (self-employed agriculture) and off-farm employment. The farm share barely fell for the poorest (Q1 and Q2), with almost all engaged in farming, but declined sharply for Q5 (to 40 per cent from almost 60 per cent) and to a lesser extent Q4. Although the share with off-farm employment increased for all quintiles, the gap between Q5 and Q1 increased slightly, and all other quintiles are 'pulling away' from Q1. The second and third quintiles were close to Q1 in 2008 but beginning to diverge by 2013. The poorest households are predominantly in farming with the lowest shares in off-farm employment and hence are least diversified.

Figure 1C shows patterns for NAS and wage employment (NAW and AW). The overall pattern shows the top two quintiles converging at just over half of the households with NAS, Q2 is catching up with Q3 at over 40 per cent, and the poorest quintile remains stuck around one-third. The pattern for wage employment is the most varied. The share is significantly higher for Q5 (increasing to over 60 per cent) but quite close at almost half in 2013 for other quintiles, and Q1 does not have the lowest share. In 2008 Q3 had the lowest share but rose to pass Q2 (which was lowest in 2013) and Q1. Figure 1D sheds light on this by distinguishing NAW and AW. As could be expected, Q5 wage employment is almost entirely NAW while about two-thirds of Q1 wage employment is AW. Furthermore, shares with NAW increase consistently for richer quintiles while the reverse is the case for AW.

To summarize, the data show that diversification has increased over the five years, and growth in off-farm wage employment, both agricultural and non-agricultural, has made an important contribution. The average number of wage workers in households has increased by almost half for AW and NAW. Growth has been faster for females, and by 2013, on average 47 per cent of households had at least one female off-farm worker (the same share as for males in 2008). For rural households, most of the additional female wage jobs are AW, whereas for males the additional jobs are more evenly split between AW and NAW. Across consumption (income) quintiles, farming and agricultural wage employment predominate for the poorest households, whereas almost 60 per cent of households in the richest quintile have non-agricultural wage employment.

The appendix provides information on differences in the characteristics of females in rural and urban areas and on the shares of males and females in casual (not full-time) employment. Rural women are, on average, older, less educated, more likely to be married, less likely to be the household head, and live in households with more dependents. The data provide a strong indication that rural women are more likely to be engaged part-time. The rural-urban difference is small for AW (but hours are slightly lower for rural females) and pronounced for NAS, with rural women on average working less than three-quarters the hours of urban women. Even for NAW, where hours worked are highest, rural females work significantly fewer hours. This is consistent with having greater domestic commitments with more dependents in the household but could also be because women are engaged in work on their own farm. Men work longer hours and are less likely to be casual in AW, but for NAW the proportion of males in casual employment is higher.

4 Empirical analysis and discussion

The relationship between income diversification and household welfare is explored using a standard reduced form model of household consumption (Glewwe 1991; Appleton 1996). Consumption (our measure of household welfare) is explained by a variety of household characteristics, to which measures of income diversification are added.

$$\log Cons_{it} = \alpha_i + \beta ID_{it} + \lambda X_{it} + \delta Z_{it} + \gamma_t + \varepsilon_{it} \quad (1)$$

The dependent variable is the log of adult equivalent household consumption; ID is the count of income sources for the household; and X is a vector of dummy variables capturing the main labour activity of the household head (farm, AW, NAS, NAW, or not employed). Vector Z is a set of controls including household size, wealth index, and a number of characteristics of the household head including their age and its square, education, and marital status¹⁰. The region the household is from and whether it is urban or rural are included as fixed effects. We include household fixed effects to account for unobserved time invariant factors, such as household attitudes towards risk or innate ability of members, being correlated with diversification (or more generally with selection into type of employment). The inclusion of these fixed effects may cause many of the other controls to drop out, but we include them as the panel contains households that have moved to a new location or split off. The γ_t captures time effects with a survey-year variable. In (1), i indexes households and t indexes time (survey), and estimation is for the panel of all three waves (except Table 5, which has estimates for each wave).

4.1 Diversification and welfare correlations

Estimating (1) indicates if measures of diversification (ID and off-farm ID) are correlated with household welfare. A positive coefficient indicates that diversification is greater for households with *relatively* higher consumption spending, suggesting it is welfare-enhancing. A negative coefficient indicates correlation with *relatively* lower consumption spending; this does not mean welfare is reduced as the measure is relative but is consistent with welfare-maintaining activities.

¹⁰ The surveys also include a category for absent household that we include, although only 75 households for the whole data set (roughly 20–30 households in each wave) record an absent head. These appear to be men in polygamous marriages or from rural areas who have migrated for work but are included as part of the household.

Table 3: Income diversification and household consumption

	OLS		FE				IV	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>ID [ID off-farm]</i>	0.049*** (0.007)	[0.085***] (0.007)	0.041*** (0.008)	[0.042***] (0.008)			0.055** (0.022)	[0.059***] (0.022)
<i>ID=2 [ID off =1]</i>					0.015 (0.017)	[0.034*] (0.018)		
<i>ID=3 [ID off =2]</i>					0.082*** (0.020)	[0.094***] (0.022)		
<i>ID=4 [ID off =3]</i>					0.120*** (0.025)	[0.118***] (0.025)		
<i>Head NAS</i>			0.069** (0.028)	0.064** (0.028)	0.069** (0.028)	0.066** (0.028)	0.051 (0.034)	0.044 (0.035)
<i>Head AW</i>			0.014 (0.065)	0.011 (0.065)	0.022 (0.064)	0.013 (0.064)	-0.061 (0.085)	-0.066 (0.085)
<i>Head NAW</i>			0.092*** (0.035)	0.084** (0.036)	0.094*** (0.035)	0.082** (0.036)	0.060 (0.043)	0.048 (0.045)
<i>Absent</i>			-0.208*** (0.040)	-0.234*** (0.039)	-0.207*** (0.042)	-0.229*** (0.040)	-0.025 (0.536)	-0.088 (0.535)
<i>Not employed</i>			0.051 (0.040)	0.048 (0.040)	0.051 (0.040)	0.048 (0.040)	0.015 (0.051)	0.010 (0.051)
<i>Wealth index</i>			0.059*** (0.006)	0.058*** (0.006)	0.059*** (0.006)	0.058*** (0.006)	0.040*** (0.009)	0.040*** (0.009)
<i>HH size</i>			-0.064*** (0.006)	-0.064*** (0.006)	-0.065*** (0.006)	-0.064*** (0.006)	-0.069*** (0.007)	-0.069*** (0.007)
<i>Head age</i>			-0.000 (0.006)	-0.000 (0.006)	-0.001 (0.006)	-0.000 (0.006)	-0.011 (0.009)	-0.011 (0.009)
<i>Head age^2</i>			-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
<i>Female head</i>			-0.111** (0.050)	-0.112** (0.050)	-0.113** (0.050)	-0.111** (0.050)	-0.168*** (0.062)	-0.169*** (0.062)
<i>Married head</i>			-0.185*** (0.035)	-0.184*** (0.035)	-0.187*** (0.035)	-0.184*** (0.035)	-0.176*** (0.043)	-0.173*** (0.043)
<i>Head education</i>			0.012** (0.005)	0.012** (0.005)	0.012** (0.005)	0.012** (0.005)	0.001 (0.006)	0.001 (0.006)
Observations	10,141	10,141	10,141	10,141	10,141	10,141	6,437	6,437
Households	3,676	3,676	3,676	3,676	3,676	3,676	3,648	3,648
R-squared	0.293	0.301	0.815	0.815	0.815	0.815		

Note: the dependent variable is the log of adult equivalent consumption. Estimators are pooled ordinary least squares (OLS), fixed effects (FE), and instrumental variable (IV). ID (ID off-farm) is the count of household sources of income, and ID=2, etc., are dummies for the given number of sources (ID = 1 is the omitted category for ID and ID off-farm = 0 is the omitted category ID off-farm). NAS indicates the household head whose main sector of employment is in non-agricultural self-employment; NAW is non-agricultural wage employment; and AW is agricultural wage employment (self-employed agriculture is the omitted category). HH size refers to the number of members of the household. The IV regressions use lagged ID as an instrument. *** p<0.01, ** p<0.05, * p<0.1.

Source: authors' calculations based on Tanzania National Panel Surveys (NBS 2010, 2011, 2013).

Results using fixed effects are in Table 3 (with 1 the omitted category for ID and 0 for ID off-farm). The first two columns are a simple OLS regression of the two ID measures on household welfare with a limited set of controls using dummies for different regions, urban or rural, and time effects. There is a strong positive correlation between ID and household welfare, indicating that for Tanzania it is households that are involved in earnings from multiple employment categories who are better off in terms of consumption/welfare. Columns (3) and (4) add additional controls as well as include household fixed effects. The strong positive correlation remains, but the difference between coefficients on ID and ID off-farm disappears (the apparently larger effect because the latter under OLS is fully accounted for by unobserved household differences). Columns (5) and (6) split the diversification variables into separate dummies for the number of sources and show that relative welfare is significantly higher for households with two (off-farm) or more income sources, irrespective of the ID measure used.

The fixed-effects regressions (3) to (6) show the positive association between welfare and income diversification remains, even accounting for household-level factors, but do not permit any inference regarding causality. The positive correlation is noteworthy as it indicates that diversified income sources are an attribute of higher welfare households. This is consistent with household diversification being driven more by pull factors or opportunity-led diversification where the availability of jobs allows households to increase income (Loison 2015). In (7) and (8) we use lagged values of the diversification measures to partially address the contemporaneous correlation between welfare and diversification. The coefficients remain positive and are larger, indicative of a positive effect of diversification on welfare, although we interpret the results with caution given the short time between the waves and likely high degree of autocorrelation for both variables.

The results also give some indicative evidence that the type of job matters: having a household head whose main sector of employment is NAW offers the highest returns, closely followed by NAS (although both are insignificant in the IV regressions, suggesting persistence). Having a household head engaged in AW employment (or not employed) has no significant effect on household consumption compared to having a head whose main income is from farming (the excluded category). Although 'absent head' is significantly associated with lower consumption, one should not read too much into this as there are very few observations. Note that the coefficient on household size is negative and significant; larger households have lower consumption and effects for income diversification control for household size. Consumption is higher for richer households (in terms of wealth index) but lower for female-headed households. Coefficients for year dummies (capturing the increase in nominal consumption over time) and other household characteristics are all significant with the expected sign (available on request)¹¹.

¹¹ The standard adult equivalence scale understates the welfare of female-headed households and households with relatively many adult females. We calculated welfare using revised scales with higher weights on adult women (see Appendix, Table A4), which gives lower mean real consumption. As the analysis in the paper is based on relative household welfare, using the revised scale has no substantive effect on the results.

Table 4: Income diversification and household consumption disaggregated

	(1)	(2)		(3)	(4)
	ID	ID off-farm		ID	ID off-farm
<i>ID interaction:</i>					
- Rural 2008	0.030** (0.013)	0.026* (0.014)	<i>Percentile:</i>		
			10%	0.039*** (0.010)	0.038*** (0.011)
- Rural 2010	0.059*** (0.012)	0.062*** (0.013)	25%	0.039*** (0.008)	0.039*** (0.008)
- Rural 2012	0.045*** (0.012)	0.047*** (0.013)	50%	0.040*** (0.006)	0.040*** (0.006)
- Urban 2008	0.026* (0.015)	0.031* (0.016)	75%	0.040*** (0.008)	0.042*** (0.008)
- Urban 2010	0.026* (0.014)	0.021 (0.015)	90%	0.041*** (0.010)	0.043*** (0.010)
- Urban 2012	0.031** (0.015)	0.031** (0.015)			
Fixed effects	Yes	Yes	Fixed effects	Yes	Yes
Observations	10,141	10,141	Observations	10,141	10,141
Households	3,676	3,676	Households	3,676	3,676
R-squared	0.815	0.815			

Note: as for Table 3, with the left panel estimating the same model but interacting ID measure with time dummies and urban/rural dummy. The right panel shows estimates for a fixed-effects quantile model using the Method of Moments-Quantile Regression estimation procedure developed by Machado and Santos Silva (2019).

Source: authors' calculations based on Tanzania National Panel Surveys (NBS 2010, 2011, 2013).

The left column of Table 4 presents results interacting the ID measures with survey year and urban or rural location. The association between ID and welfare is positive and significant in all cases (with one exception), and the coefficients are similar in all years for urban location but increasing for rural location, which has a larger coefficient than urban in the later two survey waves. The right column estimates quantile fixed-effects regressions using the Method of Moments-Quantile Regression procedure developed by Machado and Santos Silva (2019) where quantile regressions are estimated using estimates of the conditional mean, which is useful for panel models as they can be used to difference out the fixed effects. The results indicate a remarkable level of consistency in the estimates across the various percentiles for both ID measures, with coefficients remaining largely unchanged around 0.4 and highly significant in all cases. The positive association of welfare and diversification can be found across the whole income range, and the size of the effect remains largely the same¹².

4.2 Types of employment and welfare

Given the limitations of the simple count measure, to assess how employment in the different income sources is associated with household welfare, ID is replaced with a set of dummies for whether the household receives farm income (*farms*), any off-farm income (*off-farm*), and NAS, NAW, or AW (Table 5). All regressions use the full set of controls and household fixed effects. We exclude the household head's main activity as for many households the head is the sole income earner, which causes collinearity issues. Moving into any form of off-farm employment is associated with a six per cent increase in household welfare while engaging in farming has no correlation with welfare (Table 5, column 1). Column (2) splits off-farm employment into three

¹² We also accounted for household effects using a correlated random effect (CRE) quantile specification and found qualitatively similar results (available on request).

dummies for each of AW, NAS, and NAW. The positive association for off-farm employment seen in (1) is shown to arise because of employment in the non-agricultural sectors; AW is not significantly related to welfare whilst engagement in NAS or NAW is associated with an eight per cent increase in welfare.

Table 5: Off-farm employment and household consumption

	(1)	(2)	(3)	(4)		
	-	-	-	2008	2010	2012
<i>Off-farm</i>	0.061*** (0.017)					
<i>NAS</i>		0.083*** (0.016)				
<i>Rural</i>			0.087*** (0.018)	0.011 (0.027)	0.106*** (0.025)	0.135*** (0.026)
<i>Urban</i>			0.063** (0.027)	0.097*** (0.035)	0.031 (0.033)	0.070** (0.032)
<i>AW</i>		-0.024 (0.017)				
<i>Rural</i>			-0.025 (0.019)	-0.048 (0.032)	-0.004 (0.028)	-0.034 (0.028)
<i>Urban</i>			-0.008 (0.046)	0.009 (0.074)	-0.037 (0.065)	0.015 (0.067)
<i>NAW</i>		0.088*** (0.018)				
<i>Rural</i>			0.102*** (0.022)	0.126*** (0.036)	0.111*** (0.030)	0.066** (0.029)
<i>Urban</i>			0.050* (0.028)	0.032 (0.037)	0.066** (0.033)	0.067** (0.033)
<i>Farms</i>	-0.003 (0.032)	0.002 (0.032)	0.001 (0.032)		-0.000 (0.032)	
FE	Yes	Yes	Yes		Yes	
Observations	10,141	10,141	10,141		10,141	
Households	3,676	3,676	3,676		3,676	
R-squared	0.814	0.816	0.815		0.816	

Note: as for Table 3, all regressions use the full sample, and estimates by rural/urban location or for different time periods are obtained by interacting with the main regression variables.

Source: authors' calculations based on Tanzania National Panel Surveys (NBS 2010, 2011, 2013).

Regression (3) in Table 5 interacts AW, NAS, and NAW with rural and urban dummies, and the associations hold in both urban and rural locations. AW is insignificant while NAS and NAW are positive and significant, although the relationship is slightly weaker in urban areas particularly for NAW. Having NAW employment in rural areas has the strongest association with household welfare (10 per cent increase), followed by rural NAS (nine per cent), and then urban NAS and NAW (six and five per cent). In (4) we further interact the employment sources with time dummies as well as the rural/urban dummy (similar to the left panel of Table 4) to see how the associations have changed across the three panel waves. In all locations and survey waves AW remains insignificant. In rural areas the coefficient on NAS has been increasing (to a significant 13.5 per cent effect by the third wave) while the positive association with NAW has been falling (roughly halved to seven per cent), and in urban areas the trends are the reverse with the NAW coefficients increasing and NAS decreasing, both with about seven per cent in 2012/13. None of the agricultural activities are significant in any of the specifications in Table 5, while most of the non-

agricultural activities are positive and significant, and there are differing time trends in rural and urban areas even over a relatively short time period.

Table 6: Off-farm employment and household consumption by gender

	(1)	(2)		(3)	(4)	
	-	Rural	Urban	-	Rural	Urban
<i>Male off-farm</i>	0.078*** (0.017)	0.088*** (0.019)	0.045 (0.035)			
<i>Female off-farm</i>	0.030** (0.015)	0.014 (0.017)	0.078*** (0.025)			
<i>Male NAS</i>				0.094*** (0.018)	0.115*** (0.020)	0.021 (0.030)
<i>Male AW</i>				0.013 (0.021)	0.018 (0.022)	-0.017 (0.061)
<i>Male NAW</i>				0.087*** (0.020)	0.110*** (0.024)	0.021 (0.029)
<i>Female NAS</i>				0.046*** (0.016)	0.041** (0.020)	0.053** (0.025)
<i>Female AW</i>				-0.048** (0.024)	-0.056** (0.025)	0.004 (0.057)
<i>Female NAW</i>				0.084*** (0.027)	0.082** (0.038)	0.085** (0.035)
<i>HH farms</i>	-0.000 (0.032)	0.001 (0.032)		-0.000 (0.032)		-0.000 (0.032)
FE	Yes	Yes		Yes	Yes	
Observations	10,141	10,141		10,141	10,141	
Households	3,676	3,676		3,676	3,676	
R-squared	0.815	0.815		0.816	0.816	

Note: as for Table 3, all regressions use the full sample, and estimates by rural/urban location are obtained by interacting with the main regression variables.

Source: authors' calculations based on Tanzania National Panel Surveys (NBS 2010, 2011, 2013).

The lack of significance for AW in all regressions where it was included is noteworthy given that the final panel of Figure 1 shows a strong negative correlation with household consumption. This suggests that after accounting for factors that may 'push' households into such employment out of necessity, the negative association with welfare disappears. We extend this analysis to distinguish employment by gender in Table 6. The positive benefit of a male with off-farm employment is more than twice that for a female (column one), but this male effect is only significant in rural areas whereas the effect is positive and significant for females in urban areas only (column two). The coefficients on farms and male AW are always insignificant, but female AW is negatively associated with consumption (column three), suggesting distress especially in rural areas as this is the only case where AW is significant (column 4). The gender differential favouring males applies to NAS, but this is driven by rural areas (female NAS is larger and significant in urban areas). The gender differential benefit is minimal for NAW overall but is greater for males in rural areas and only significant for females in urban areas.

4.3 Influences on diversification

The increased diversification shown in Section 3 appears in general to have been associated with higher welfare if into non-agricultural, especially wage, activities (although there is no clear evidence of causality). These could be considered as pull activities where individuals are attracted into higher-earning activities. In contrast, agricultural wage employment is a push activity that tends to be associated with lower relative welfare (but may be welfare-maintaining). A significant number of individuals, especially females, moved into AW—17 per cent of rural households in 2010 and 2012 and even five per cent of urban households—although exit rates were also high (Table 7). Table 7 shows that NAS and NAW exhibited the highest entry (and exit) rates for urban households, but AW had typically the highest entry for rural households.

Table 7: Off-farm employment entry and exit rates (%)

	Non-agricultural self				Agricultural wage				Non-agricultural wage			
	Rural		Urban		Rural		Urban		Rural		Urban	
	2010	2012	2010	2012	2010	2012	2010	2012	2010	2012	2010	2012
<i>None</i>	49	48	25	25	62	57	91	89	73	69	39	34
<i>Exit</i>	12	15	12	12	11	14	3	3	7	11	8	16
<i>Continue</i>	22	23	44	49	10	13	1	2	7	9	39	40
<i>Entry</i>	17	14	19	14	17	17	5	5	12	11	14	11

Note: the data are population weighted and show the percentage of households that did not engage in each activity in the current or previous wave (*none*), left the activity since the previous wave (*exit*), engaged in the activity in both the current and previous waves (*continue*), or engaged in the current wave but not the previous (*entry*).

Source: authors' calculations based on Tanzania National Panel Surveys (NBS 2010, 2011, 2013).

To investigate the characteristics of households engaging in the different types of off-farm employment, we estimate regressions of the determinants of new entrants (household with any member reporting an additional activity) and continued engagement for the three types of employment. We estimate models similar to Van den Broeck and Kilic (2019) but for household-level entry and continuation for the three types of off-farm employment:

$$P(y_{it}=1 | y_{it-1}=0) = \alpha + \beta Wealth_{it-1} + \lambda X_{it-1} + \mu_c + \gamma_t + \varepsilon_{it} \quad (2)$$

$$P(y_{it}=1 | y_{it-1}=1) = \alpha + \beta Wealth_{it-1} + \lambda X_{it-1} + \mu_c + \gamma_t + \varepsilon_{it} \quad (3)$$

In both regressions, y is a binary variable = 1 if household I is engaged in a specific type of off-farm employment at time t . $Wealth$ is the household wealth index, and X is a vector of additional controls, both lagged to reduce endogeneity; μ_c captures community fixed effects and γ_t time effects. Although developed specifically for rural households, we use the livelihood approach (Ellis 1999; Winters et al. 2001; Nielsen et al. 2013) as it provides a useful framework for understanding livelihood strategies of households at a national level. The approach emphasizes the role of assets/capital (physical, human, natural, social, and financial), accessibility (to different employment opportunities), and shocks as being the main factors shaping employment patterns. The wealth index incorporates different aspects of capital (mostly holdings of physical capital but also of natural and financial capital) and is preferred to the consumption expenditure as being broader. Human capital is captured using the education level of the household head, a number of characteristics of the household head (sex, age, age squared, and marital status), the number of adult members in the household, and the number of children (aged <15). Accessibility is controlled

for using community-level dummies to capture access to amenities, infrastructure, and distance to main economic centres. To the extent social capital is locally based, the community dummies can also be a useful control for such capital. We also include a dummy for whether the household engages in farming and separate variables for the number of adult male and adult female members to reflect potential gender-based accessibility to employment.

We separate shocks into idiosyncratic and covariate shocks using dummies for whether a household faced such shocks in the last two calendar years (Van den Broeck and Kilic 2019; Sènakpon and McPeak 2020). Idiosyncratic shocks are captured by whether there was a death or serious illness in the household, and covariate shocks are captured by two dummies for droughts and large increases in food prices. The inclusion of community-level fixed effects is likely to take out much of the variation from the covariate shocks; thus, we will focus more on the idiosyncratic shocks (particularly as the importance of this shock will be similar across urban and rural areas). Finally, following Loison (2019), we include a measure of distress that is a dummy for households who had to take out a loan to meet subsistence needs in the last year. This is to capture the livelihood strategies of the poorest households. The main focus will be on the wealth variable as it can help determine the motivation behind entry into the employment sources (Dimova and Sen 2010). A negative correlation with wealth indicates distress or subsistence shortfall (welfare-maintaining), while a positive correlation implies accumulation motives (welfare-enhancing).

Table 8 presents estimates of ‘entry’: the dependent variable is 1 if the household newly entered the employment type from the previous wave and 0 otherwise. All dependent variables are lagged (the values from the previous wave when the household was not engaged in the activity). We estimate a linear probability model for ease of interpretation (Probit gives similar results) and present estimates from separate regressions for urban and rural areas.

Table 8: Determinants of entry into employment by location

	Non-agri self		Agri wage		Non-agri wage	
	Rural	Urban	Rural	Urban	Rural	Urban
<i>Wealth index</i>	-0.014*** (0.003)	0.005 (0.005)	-0.011*** (0.003)	-0.009*** (0.003)	-0.005 (0.003)	-0.007 (0.004)
<i>Head education</i>	0.001 (0.002)	0.005 (0.004)	-0.007*** (0.003)	0.001 (0.002)	0.004* (0.002)	-0.001 (0.003)
<i>Subsistence loan</i>	0.030 (0.043)	-0.054 (0.059)	0.015 (0.048)	-0.023 (0.017)	-0.003 (0.037)	0.053 (0.072)
<i>Shock: death</i>	-0.012 (0.021)	-0.016 (0.030)	0.026 (0.025)	-0.027 (0.019)	0.030 (0.020)	0.070** (0.032)
<i>Shock: drought</i>	0.010 (0.020)	-0.051 (0.035)	-0.002 (0.022)	-0.014 (0.027)	0.017 (0.018)	0.007 (0.041)
<i>Shock: price</i>	-0.005 (0.015)	-0.008 (0.020)	-0.009 (0.016)	0.017 (0.014)	-0.004 (0.013)	0.022 (0.019)
<i>HH farms</i>	-0.052 (0.046)	-0.022 (0.025)	0.024 (0.039)	0.016 (0.012)	0.008 (0.041)	0.040 (0.025)
<i>Adult males</i>	0.018** (0.008)	-0.003 (0.009)	0.004 (0.008)	0.004 (0.007)	0.009 (0.007)	0.010 (0.010)
<i>Adult females</i>	0.003 (0.008)	-0.016 (0.011)	-0.001 (0.009)	0.005 (0.007)	0.007 (0.007)	-0.000 (0.010)
<i>Children</i>	0.001 (0.004)	0.003 (0.007)	0.004 (0.004)	0.001 (0.005)	0.002 (0.003)	-0.001 (0.007)
<i>Head age</i>	-0.001 (0.003)	-0.011** (0.004)	-0.002 (0.003)	0.002 (0.002)	-0.002 (0.002)	-0.005 (0.004)
<i>Head age²</i>	0.000 (0.000)	0.000** (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
<i>Female head</i>	-0.049* (0.026)	0.031 (0.037)	-0.025 (0.026)	0.016 (0.023)	-0.034 (0.021)	0.035 (0.036)
<i>Married head</i>	-0.076*** (0.026)	0.048 (0.034)	-0.043* (0.025)	0.002 (0.019)	-0.039* (0.021)	-0.016 (0.030)
Community FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,479	2,223	4,479	2,223	4,479	2,223
R-squared	0.088	0.131	0.085	0.212	0.088	0.170

Note: estimates from a linear probability model for households who newly entered the type of employment since the last wave. Rural and urban samples are estimated separately. The explanatory variables are all lagged with one time period. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: authors' calculations based on Tanzania National Panel Surveys (NBS 2010, 2011, 2013).

Very few of the determinants of new entry are significant, but there are some indicative results. Wealth is negatively correlated with entry into AW and into NAS in rural areas. The negative correlation with wealth is consistent with diversification motivated by push factors or for welfare maintenance. The household head's years of education is also negatively correlated with AW in rural areas, indicating fewer skilled workers. Wealth has no significant relationship with NAW in either urban or rural areas; however, in rural areas, the household head's education does have a positive effect on entry, consistent with NAW for the more educated. The measure of distress is not significant in any of the regressions, while for the shocks only recent death or illness are significantly related to increasing the probability of entry into NAW in urban areas.

Table 9: Determinants of continual employment by location

	Non-agri self		Agri wage		Non-agri wage	
	Rural	Urban	Rural	Urban	Rural	Urban
<i>Wealth index</i>	0.037*** (0.005)	0.005 (0.007)	-0.017*** (0.003)	-0.005** (0.002)	0.022*** (0.004)	0.009* (0.005)
<i>Head education</i>	0.005* (0.003)	-0.012*** (0.005)	-0.007*** (0.002)	-0.000 (0.001)	0.007*** (0.002)	0.018*** (0.004)
<i>Subsistence loan</i>	-0.016 (0.049)	-0.005 (0.078)	0.111** (0.049)	0.015 (0.021)	0.039 (0.032)	0.063 (0.079)
<i>Shock: death</i>	0.014 (0.025)	0.024 (0.043)	0.002 (0.019)	0.017 (0.013)	-0.006 (0.015)	0.015 (0.037)
<i>Shock: drought</i>	0.000 (0.022)	-0.073 (0.050)	-0.004 (0.019)	0.014 (0.018)	-0.005 (0.013)	0.001 (0.046)
<i>Shock: price</i>	0.017 (0.016)	0.011 (0.026)	-0.001 (0.013)	0.001 (0.007)	0.010 (0.011)	0.014 (0.024)
<i>HH farms</i>	0.084 (0.054)	0.021 (0.035)	0.019 (0.030)	-0.008 (0.008)	-0.135** (0.056)	-0.097*** (0.033)
<i>Adult males</i>	0.014 (0.009)	0.038*** (0.012)	0.017** (0.007)	-0.004 (0.003)	0.018*** (0.006)	0.049*** (0.013)
<i>Adult females</i>	0.027*** (0.009)	0.030** (0.015)	-0.009 (0.007)	-0.001 (0.003)	0.021*** (0.007)	0.029** (0.014)
<i>Children</i>	0.011** (0.004)	0.017* (0.010)	0.001 (0.003)	-0.003 (0.003)	-0.008*** (0.003)	0.003 (0.009)
<i>Head age</i>	-0.002 (0.002)	0.005 (0.006)	0.002 (0.002)	0.001 (0.002)	-0.001 (0.002)	-0.001 (0.005)
<i>Head age²</i>	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)
<i>Female head</i>	0.041 (0.026)	0.028 (0.049)	-0.000 (0.023)	-0.008 (0.008)	-0.009 (0.014)	-0.132*** (0.046)
<i>Married head</i>	-0.007 (0.025)	0.063 (0.043)	-0.039* (0.022)	0.007 (0.009)	-0.014 (0.015)	-0.092** (0.041)
Community FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,479	2,223	4,479	2,223	4,479	2,223
R-squared	0.220	0.257	0.164	0.249	0.264	0.322

Note: estimates from a linear probability model for households who continued on in the type of employment since the last wave. Rural and urban samples are estimated separately. The explanatory variables are all lagged with one time period. *** p<0.01, ** p<0.05, * p<0.1.

Source: authors' calculations based on Tanzania National Panel Surveys (NBS 2010, 2011, 2013).

Table 9 reports results for continuing employment into each of the three types of off-farm work. The estimates for AW are consistent with this type of employment being driven by welfare maintenance motivations particularly in rural areas: poorer and less educated households are more likely to continue working in AW as well as those that may have experienced some distress and had to obtain a loan to meet consumption needs. The NAS regressions indicate somewhat contrasting motivations in rural and urban areas: in the former it is wealthier and more educated households that continue in this sector, while in urban areas wealth has no significant effect on continuation and education is negatively related (more likely to exit). Comparing to estimates in Table 8, entry into rural NAS is negatively related to wealth while continuation in rural NAS is positively related to wealth. This suggests that the rural informal sector is welfare-increasing.

Relatively poorer households enter (perhaps driven by survival), and this increases income so they continue; NAS is a better strategy than AW as wealthier households do not exit. The farm variable for NAS in rural areas is positive and almost statistically significant, consistent with this being a good diversification strategy. For NAW the results in urban and rural areas both indicate that such employment is driven by accumulation or welfare-enhancing motivations with richer and more educated households being more likely to continue. Engaging in farming is negatively related to continuing in NAW in both urban and rural areas (but not significant in any of the other regressions). If the household has no farm to fall back on, a member is less likely to exit NAW (or perhaps one 'retires' to the farm).

5 Conclusion

The paper investigated the role of income diversification on household welfare using three waves of Tanzanian National Panel Surveys (2008/09, 2010/11, and 2012/13) to construct a panel with 10,141 observations from 3,676 households that appear in at least two waves. Household income sources are separated into four labour categories that can be consistently measured at the national level within each wave and can be tracked accurately across waves given the changes in the underlying questionnaires. The labour activities are agriculture (farming), non-agricultural self-employment (NAS), and agricultural (AW) and non-agricultural (NAW) wage employment. Household welfare is measured in terms of food consumption (adult equivalent expenditure). Income diversification is captured by the number and types of sources of income for household workers.

Households in Tanzania have increased diversification of sources of income even over the five-year period from 2008 to 2013, and this has been associated with higher household welfare. There has been significant growth in agricultural wage (especially for rural females) and non-agricultural wage employment, while the percentage of households with any member with income from non-agricultural self-employment increased only slightly. The average number of wage workers in households has increased by almost half, and growth has been faster for females so that gender participation gaps in wage employment are declining. For rural households, most of the additional female wage jobs are agricultural wage employment, whereas for males the additional jobs are more evenly split between agricultural and non-agricultural wage employment. Across consumption (income) quintiles, farming and agricultural wage employment predominate for the poorest households, whereas almost 60 per cent of households in the richest quintile have non-agricultural wage employment.

We draw five main conclusions:

- The positive and significant association between diversification and welfare is greater for rural (for which it has increased over time) than for urban households. The higher welfare is associated with non-agricultural off-farm employment (NAS or NAW). Engaging in agricultural wage employment is not significantly related to welfare.
- The positive benefit of off-farm employment is noticeably greater for males than for females in rural areas (where females work fewer hours, either because there are more dependents in the household or they are also working on the farm), whereas the benefit is for females in urban areas. In both cases, the benefits are driven by non-agricultural self-employment; the gender differential for non-agricultural wage is small (but females are less likely to be in casual employment).
- Female agricultural wage employment is negatively associated with household welfare, especially in rural areas where females in poorer households (lower wealth or less educated

head and more dependents) are more likely to enter and remain in agricultural wage employment. This is consistent with diversification motivated by push factors as the only option for less educated females to help maintain household food consumption.

- Members of poorer households are more likely to enter, but less likely to remain in, rural non-agricultural self-employment. This suggests it is sustained as a welfare-increasing diversification strategy.
- The only significant determinant of entry into non-agricultural wage employment is the household head's education (in rural areas), while richer and more educated households are more likely to continue (farm households are less likely to continue). Growth in non-agricultural wage employment is a gender-inclusive welfare-increasing diversification strategy.

There is an association between labour diversification and higher household welfare, but not all types of off-farm employment are equally beneficial, and there are significant gender differences. Non-agricultural self-employment is beneficial, irrespective of gender, but has grown relatively slowly; policies that support informal opportunities, especially in rural areas, would facilitate gender-inclusive welfare-improving diversification. There is nothing new in observing that non-agricultural wage employment is beneficial for both genders, and the relatively high growth is a good sign. Continuing to support increased education and wage employment opportunities is worthwhile. Although agricultural wage employment has been an important source of new employment opportunities for females, especially in rural areas, it is not a good diversification strategy as disadvantaged females are pushed into low earning employment. Increased support to improve productivity seems essential to increase potential earnings from agriculture (wage or farming) and will tend to benefit women. For the poorest rural households, employment opportunities will remain limited and public support will be required. There is evidence that public work projects are successful at targeting women and the poor with earnings probably at least comparable to agricultural wage work¹³.

These findings contrast with those of Khan and Morrissey (2019) for Uganda where the general finding is that engaging in more labour activities is primarily because of push factors: lower income households need to engage in more activities to meet their consumption needs, and these are primarily in agricultural wage employment where jobs are, especially for females, associated with lower consumption. In Uganda it appears that diversifying income sources is a sign of distress and driven by push factors or what Loison (2015) classifies as 'survival-led' as opposed to 'opportunity-led' diversification. Survival-led diversification suggests that poorer households are forced to diversify into low return activities in order to ensure survival and reduce vulnerability to shocks. We do not find this to be the case in general for Tanzania.

A number of the findings for Tanzania in Van den Broeck and Kilic (2019) are consistent with or complementary to our analysis: women are less likely to participate in off-farm wage employment, and when they do it is most likely to be agriculture; the majority of those working report only one job; and women are significantly less likely than men to be in non-agricultural wage employment. The broad findings are consistent with evidence from the literature on the importance of off-farm employment for rural households but goes further in including urban households and distinguishing effects, in terms of welfare, of the type of employment. Non-agricultural self- and wage employment are associated with higher welfare, and growth of non-agricultural wage

¹³ An assessment report of the TASAF Public Works Programme finds that the scheme targets the poor and has a 70 per cent female participation rate with potential to scale up (see <http://ispatools.org/tools/ISPA-Country-Report-Tanzania-PWP.pdf>).

employment in Tanzania has helped to raise welfare for households. Agricultural wage employment has also increased, but this does not deliver a benefit in terms of higher consumption (especially for females). Income diversification does matter for household welfare, but there are differences by gender and activities where opportunities are available that have important implications for the effect of diversification.

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Appendix

Accounting for characteristics of females

The analysis showed that female employment tended to be associated with lower household welfare, especially in rural areas. Although female non-agricultural wage employment tended to be the exception, females may have lower earnings in some sectors such as manufacturing if they have fewer skills or work fewer hours (given the demands of domestic work). The data do not permit direct testing or analysis at such a fine level. We can however explore patterns in the data on the differences between characteristics of females in urban compared to rural areas. This can shed light on a number of issues. Are rural females more likely to be in casual or part-time work? Are rural women more constrained by domestic commitments because, for example, they are less educated or in households with more children?

The pattern of rural-urban differences is quite similar in each survey wave (or year) so Table A1 pools data from the three surveys, defining females as women aged between 15 and 65 years. Rural women are, on average, older, less educated, more likely to be married, and less likely to be a household head (and more likely to be the spouse of the household head). All of these differences are significant. Rural women live in households with more dependents, with on average an extra child (aged 0–15 years), particularly more infants (aged less than or equal to 5), and more elderly (aged over 65).

Almost 90 per cent of rural women engaged in some self-employed agriculture work in the last year (for three-quarters it is also their main occupation) compared to only 30 per cent of urban women (for whom 17 per cent is their main occupation). Of those who farm, rural women spend significantly more time farming, amounting to three extra hours in the last week (about 10 per cent more than urban women). Data on other domestic labour are limited, but some indications can be drawn from hours spent in the previous day before fetching firewood or water. More rural women fetched firewood/water in the previous day (62 per cent vs. 46 per cent) and spent more than half an hour longer doing so than urban women who also had such tasks.

Table A1 shows that rural women were less likely than urban women to work in non-agricultural self-employment (17 per cent vs. 30 per cent), and most of the difference is accounted for by the services sector. Hours worked are only reported in the third wave (2012/13) but suggests that rural women in NAS are more likely to be in part-time employment as they spent fewer hours working. On average, rural women worked 33 hours per week over the last year in NAS compared to 48 hours for urban women.

Similar differences arise for wage employment. Although the percentage of rural women in wage employment is only slightly (but significantly) lower than for urban women, some three-quarters of rural women are in agricultural wage employment whereas over 80 per cent of urban women are in NAW jobs. Rural women work fewer hours in both types, but the difference is only significant for non-agricultural wage work (urban women work about 20 per cent more hours). Agricultural wage employment appears to be part-time as in both rural and urban areas women work an average of about 20 hours per week, less than half the hours for non-agricultural wage employment.

The data provide a strong indication that rural women are more likely to be engaged part-time. This is true even for AW employment; although AW accounts for less than half of a typical working week in urban and rural areas, hours are slightly lower for rural females. The difference is more pronounced for NAS, with rural women on average working less than three-quarters the

hours of urban females. Even for NAW, where hours worked are highest, rural females work significantly fewer hours. This is consistent with having greater domestic commitments with more dependents in the household but could also be because women are engaged in work on their own farm.

Table A1: Characteristics of rural and urban women

	Rural	Urban	Difference	Significance
<i>Individual characteristics</i>				
Age	32.3	30.4	1.9	***
Years of education	4.7	7.0	-2.3	***
Married %	60.4	44.6	15.8	***
Head %	14.2	17.9	-3.7	***
Spouse %	50.0	40.9	9.1	***
<i>Household composition</i>				
Children	3.03	1.90	1.13	***
Children under 5	1.32	0.76	0.56	***
Over 65	0.20	0.13	0.07	***
<i>Farming and domestic labour</i>				
Farms %	88.6	29.0	59.6	***
Mainly farms %	76.2	17.1	59.1	***
Hours worked on farm	26.9	23.7	3.2	***
Fetches water/firewood %	61.6	45.7	15.9	***
Hours fetching water/firewood	1.4	0.8	0.6	***
<i>Self-employment and wage employment</i>				
Non-agri self-employment %	17.4	29.8	-12.4	***
- Industry %	2.6	3.0	-0.4	-
- Service %	14.8	26.6	-11.8	***
Hours worked (2012/13 only)	33.2	47.6	-14.4	***
Wage employment %	16.7	19.2	-2.5	***
- Agri %	12.6	2.2	10.4	***
- Non-agri %	4.2	17.0	-12.8	***
Hours worked	26.9	53.2	-26.3	***
- Agri	20.7	24.3	-3.6	-
- Non-agri	42.7	56.3	-13.6	***
Observations (N)	11,341	6,452		
N (2012/13)	4,672	2,604		

Note: mean values pooled across all survey waves; significance (***) is at 1 per cent level) for t-test of the difference in means for rural and urban females. Farms refers to those engaged in any self-employed agriculture in the last year (shares for whether anyone in the household farmed are 97.2 per cent rural and 48.1 per cent urban). Shares in different types of employment can add up to over 100 per cent because many individuals are engaged in more than one activity.

Source: authors' calculations based on Tanzania National Panel Surveys (NBS 2010, 2011, 2013).

Only the 2012/13 wave asked questions on hours worked in NAS employment. Table A2 shows that half of rural women in NAS spent 25 hours or less a week on average on that activity (compared to less than one-quarter of urban women). Almost 80 per cent of rural female NAS worked no more than 50 hours per week in that activity compared to just over 60 per cent in urban areas. The proportion of urban female NAS working 70 hours per week or more was twice that of rural NAS (over 20 per cent compared to under 10 per cent). This could be partly because rural women spent more time on domestic work but also because they were more likely to have other work (such as farming). The pattern of hours worked by men is included for comparison and shows that men worked longer hours on average in both rural and urban areas, with a similar difference between areas (men worked fewer hours on NAS in rural areas).

Table A2: Cumulative frequency of average hours worked in NAS for 2012/13

Hours	Females		Males	
	Rural	Urban	Rural	Urban
10	16.7%	6.7%	15.9%	5.4%
25	49.6%	23.6%	37.5%	16.8%
40	68.5%	46.0%	55.8%	29.5%
50	79.5%	61.6%	67.6%	43.8%
60	84.4%	69.9%	76.8%	58.1%
70	90.9%	78.3%	84.7%	74.5%
70+	100%	100%	100%	100%

Note: cumulative percentages of hours worked in an average week for individuals in employment.

Source: authors' calculations based on 2012/13 Tanzania National Panel Survey (NBS 2010, 2011, 2013).

Table A3: Casual female and male wage work for 2012/13

	Females		Males	
	Casual	N	Casual	N
Rural	85.5%	857	81.5%	1,393
Urban	56.6%	527	58.3%	1,005
AW	97.5%	670	93.8%	760
NAW	52.9%	714	61.2%	1,638
Rural AW	97.8%	600	94.7%	674
Urban AW	94.3%	70	87.2%	86
Rural NAW	56.8%	257	68.3%	719
Urban NAW	50.8%	457	55.6%	919

Note: average proportions of females or males in casual (not full-time) employment by agricultural wage (AW) and non-agricultural wage (NAW).

Source: authors' calculations based on 2012/13 Tanzania National Panel Survey (NBS 2010, 2011, 2013).

The 2012/13 wave asked questions on casual NAS employment (part-time or temporary or seasonal as opposed to permanent or fixed-term of at least one year's duration). Table A3 shows that overall 86 per cent of rural female wage workers are casual compared to just over half in urban areas. Almost all female AW is casual (98 per cent in rural and 94 per cent in urban areas), and over half of female NAW is casual. Overall, a lower proportion of rural males are in casual wage

employment, but this is attributable to AW (and a larger proportion of men are in NAW vis-a-vis AW than women); for NAW, the proportion of males in casual employment is higher (especially rural). Women who work in NAW are more likely than men to be in permanent work in both rural and urban areas. This could be a sign that (more educated) women go into wage work if they have a permanent position and are less likely to take up casual wage work.

The analysis in the paper uses the standard adult equivalence scale to measure real household consumption, but this understates female calorific needs, especially for working-age women, and underestimates poverty of female-headed households (or households with relatively many adult females). The revised scales remove the gender bias with higher weights on women aged between 15 and 59 years. Table A4 shows that the revised scale gives lower mean real consumption and the bias is greater for female-headed households and those with more adult females. However, as the analysis in the paper is based on relative household welfare, using the revised scale has no substantive effect on the results. We re-estimated Tables 3–6 using the revised scale, and there are no changes in sign, very few changes in significance, and no coefficients become insignificant (results available on request). Being a female-headed household has a more adverse effect on welfare (Table 3), and in Table 6 the male employment coefficients are slightly larger in absolute terms and female employment coefficients are slightly smaller.

Table A4: Average household real consumption comparisons

Household type	Per AE [1]	Revised AE [2]	Ratio [2]/[1]	N
All	739,000	701,000	0.95	11,992
Male head	739,000	710,000	0.96	9,012
Female head	739,000	673,000	0.91	2,980
No. of female adults				
0	1,549,000	1,549,000	1.00	685
1	746,000	706,000	0.95	6,633
2	615,000	575,000	0.93	2,883
3	596,000	553,000	0.93	1,192
4	607,000	562,000	0.93	405
5+	650,000	601,000	0.92	194

Note: household welfare is the average across all survey waves, measured as real consumption in adult equivalent scale [1] and revised adult equivalent scale [2], that gives greater weight to the caloric needs of women. The ratio is the latter as a proportion of the former.

Source: authors' calculations based on Tanzania National Panel Surveys (NBS 2010, 2011, 2013). Revised adult equivalent scale from Nyssölä et al. (forthcoming).