Firm Formation and Occupational Changes in Tanzania

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1 Introduction

Tanzania has experienced rapid growth since the 1990s, with a GDP growth rate of about 5-7% since 2000, making it one of the highest performing countries in sub-Saharan Africa. However, this high growth rate has not translated into a proportional decline in poverty rates[1] (Page, 2016). During the same period, Tanzania has been transitioning from an agricultural economy to a service economy with very little growth in the manufacturing sector. Despite its small size, the manufacturing sector is the most productive with the potential to drive the future growth of the country. As a result, the Tanzanian government has set initiatives to encourage the development of industry. Given that poverty has been decreasing slowly in comparison to economic growth, it is important to ask whether, and to what extent, the growth of the industrial sector will affect Tanzanians.

In this paper we take the first step towards answering this question by investigating the effects of the opening of manufacturing firms[2] on the employment decisions of Tanzanians. Much has been written about the relationship between firm formation and regional development, however, the bulk of this literature is restricted to research on the developed world. This is probably because the data required for such studies can only be found in countries with detailed records. Our novel contribution will be to modify the framework described in the literature to measure the responses to firm formation in a developing country.

Workers in developing countries are more responsive to new employment opportunities. Thus, we can expect that the opening of a firm in this setting will have different impacts than the opening of one in a developed country where people's jobs are more stable and the country has already been industrialized. As employment in industry tends to pay more than employment in agriculture, the opening of a firm would raise the opportunity cost of remaining in this sector. Therefore, we should expect to see workers moving out of agriculture and into industry. Additionally, the higher average wage will increase local demand, which

[1] It is worth noting that GDP growth is overstated unless we take population growth into account. Tanzania is about average in terms of GDP per capita when compared to other sub-Saharan countries.

[2] The rest of this section uses manufacturing firms and firms interchangeably

will create an incentive to start new firms to provide additional goods and services. We would then expect workers to move out of agriculture and into services, as the service sector is more productive.

Gender is another important dimension to consider in this setting. The mining literature in Tanzania shows that the opening of a new mine attracts men into mining, and women into services (Chuhan-Pole, Dabalen & Land, 2017). As the roles of men and women are more rigidly differentiated in developing countries, we can expect men and women to react differently to a firm opening.

Additionally, in developing countries like Tanzania, the decision making unit is often the household as opposed to the individual, and households tend to use diversification to cope with poverty (Ellis, 2000). This is to say that in a given household some members might be engaged in agriculture while others are engaged in different sectors to mitigate the negative effects of a shock in any given sector. The opening of a new firm can provide a new avenue for diversification. However, if it is the case that the additional wages from industry substantially raise the household's income, we might expect some members of the household, especially women, to leave the workforce altogether to tend to household obligations. Thus, the likely effect of firm formation on overall employment is ambiguous for women. As the employment rate for men is already high in Tanzania, we would expect the effect of new firm formation to be small or insignificant.

To summarize our predictions: i) we expect to see an exit from agriculture into both industry and services, ii) we expect the aforementioned movements to be of different magnitudes for men and women with women moving more towards services and men towards industry, and iii) we do not have a rigid expectation for the overall change in employment for women or men.

We test the above hypotheses using data from the Demographic and Health Surveys, the Tanzanian Census, the Census of Industrial production, and a modified model from Fritsch (1997). We find that the opening of a manufacturing firm decreases employment

in agriculture for both men and women, and increases employment in both services and industry. The effect of firm formation on overall employment is found to be ambiguous.

The rest of the paper is structured as follows: the next section provides a brief overview of Tanzania and its industrial sector. Section 3 contains a review of the literature on mining in Tanzania, as well a review of the literature on firm formation. Section 4 describes the data used for our analysis, and Section 5 describes the models used to conduct our analyses. Section 6 provides the primary results and a discussion of our analysis. Section 7 concludes.

2 Manufacturing in Tanzania

2.1 Overview of the Tanzanian economy

Tanzania (Tanganyika) gained independence in 1961. Between 1967 and 1985 it was under socialist control and during this period Tanzania's agricultural sector grew as a percentage of the economy. Starting in 1986, the Tanzanian government took steps to privatize industry. Since the early 2000s, the trend of a growing agricultural sector reversed, with the percentage of the labor force engaged in agriculture dropping from 86% to 73% between 2000 and 2010 (Page, 2016).

Tanzania has been one of the best performing economies in Sub-Saharan Africa since the 1990s. Unlike most developing countries, those in Sub-Saharan Africa, along with Tanzania, seem to be directly trasitioning from an agricultural-based economy to a service-based economy (Grabowski, 2015). A possible explanation for this is that labor costs are higher in Tanzania than in other developing countries in Asia, implying that Tanzania does not have comparative advantage in manufacturing (Grabowski, 2015). Despite the shift to services, about two-thirds of Tanzanians are still employed in agriculture. Around a quarter of Tanzanians work in the service sector, while just under 6% are employed in industry. These trends for males versus females can be found in Figure 1 (The World Bank, 2019; CIA, 2019).

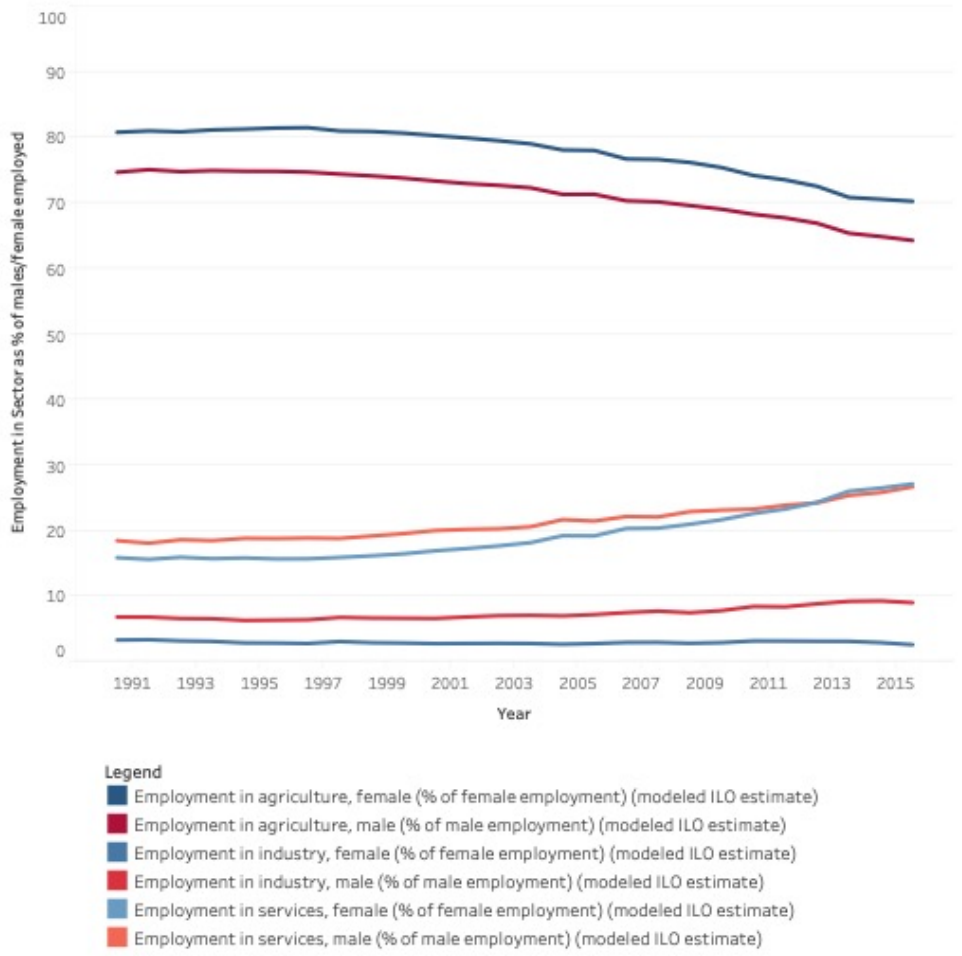

Figure 1: Employment of men and women by sector over time.

2.2 Size and Composition of the Manufacturing Sector

While the manufacturing sector in Tanzania only employs around 6% of Tanzanians, it is important to note that it contributed to 28.9% of GDP in 2017. In comparison, agriculture contributed to 23.4% of GDP in the same year, while services contributed to 47.6% of GDP (CIA, 2019). It is clear that the industrial sector is more productive than the other two, and contributes disproportionately to GDP given its size. It is mostly dominated by agro-processing (55%), followed by furniture (13%), non-metallic mineral products (11%), tobacco (7%), and textiles (5%) (Page, 2016). Tanzania has an extremely high rate of entrepreneurship (25%) and approximately 18% of Tanzania's household enterprises are

involved in manufacturing, especially in the manufacturing of beverages, apparel and furniture. (Page, 2016).

3 Literature Review

3.1 Evidence from Mining in Tanzania

There are no papers that directly investigate the regional effects of manufacturing firm formation in Tanzania. However, there are papers investigating the socio-economic effects of mine openings. While the dynamics surrounding mine openings and industrial firm formation are different, examining the mining literature can give us a general sense of employment trends in Tanzania.

Even though a mine may not directly increase employment as it is very capital intensive, its opening or restarting generates a clustering of economic activity around it. Wages in mining tend to be higher than the average wages in the community, which results in a higher demand for goods and services from those who work in mines. This would hypothetically result in the reallocation of labor and other resources into new sectors like services and away from agriculture. Additionally, it is often hypothesized that access to resources like water, electricity, or toilets might increase as a result of mine openings (Chuhan-Pole et al., 2017).

The authors of Mining in Africa (Chuhan-Pole et al., 2017) find that women have much higher non-farm opportunities, especially in sales and services, near an active mine site. Women's employment in agriculture is found to decline, while their likelihood to work year long rises. Overall employment is found to rise but employment in agriculture is found to decrease. They also find evidence to support the idea that opening a mine causes indirect positive effects, such as increased regional economic growth and increased access to electricity. They note, however, that the increased regional growth is not persistent and the effect dissipates over time.

3.2 Firm Formation on Regional Employment

3.2.1 Overview of results

There have been several papers written on the effects of firm formation on regional employment and vice versa. It should be noted that these papers have focused mainly on developed countries. Even though we are interested in the relationship between firm formation and employment choices in a different context, this literature is helpful as it provides us with a framework to work with.

The general findings in the literature are mixed. While some papers find a positive effect of firm formation on employment and regional growth (Acs and Armington, 2003; Reynolds, 1994, 1999), this is usually the case for studies done in the United States. In other countries such as Sweden, Finland, Great Britain and Germany, positive findings are relatively rare. For example, Brixy (1999) finds a positive relationship between new firm formation and regional employment in East Germany, but Audretsch and Fritsch (1996) find no such relationship in West Germany. It has been suggested that discrepancies in the effect of firm formation and regional employment might be due to the lag between the opening of a firm and its effects (Fritsch and Mueller, 2004). It has also been suggested (Cheng and Li, 2010) that the inconsistencies in findings are due to the variability in different regions within a country which might have their own firm formation mechanisms and economic structures.

3.2.2 The Fritsch Model

Our main model of interest is that proposed by Fritsch (1997) for the effects of firm formation on regional employment change. Fritsch (1997) argues that while opening a firm is immediately followed by an increase in employment, the subsequent supply-side effects determine the overall effect of firm formation. When a firm enters the market, it can drive out competitors who are less efficient which would negatively affect employment. Over time, however, the industry will become more efficient and grow which should result in an increase in

employment. Thus, the effect of a firm opening will change over time, and its overall impact will depend on the relative sizes of the positive and negative pressures. It is important to note here that this mechanism can be observed even if the new firm does not succeed, and that the magnitude of its effect will depend on its quality, i.e. how efficient it is. This framework also assumes a well-formed and reactive market which forces existing producers to become more efficient in the face of a new producer.

The caveats to this model are particularly important to our study as the manufacturing sector in Tanzania is relatively small and not very competitive (Page, 2016). This means that we should expect to see minimal changes in employment due to supply-side effects, and mostly observe the direct employment effects.

In his empirical work, Fritsch uses an adjusted start-up rate as the independent variable, and a 2-year change in employment as the dependent variable. For this paper, we do not have access to firm start-up rates. Instead, we use the starting year of firms to create an index to capture the size and number of firms in the district.

3.2.3 Findings from Papers using the Fritsch Model

Fritsch and Mueller (2004) use start-up rates over time to account for firm formation in West Germany, and they find that the highest positive impact on regional employment change is due to firm formation rates of the current year, as well as that of six and seven years ago. The start-up rates of three and four years ago have a significant negative impact on employment change. The effect of firm formation disappears within ten years. They find that employment gain due to the indirect supply-side effects of new firm formation are much larger than the effect due to direct employment. With regards to manufacturing in particular, they find that the supply side effects are smaller than in services, which they attribute to the large and diffused markets for the output of manufacturing firms. The thought is that the distance between the firms and their markets results in less concentrated regional effects. Their finding contradicts Geroski's (1995) conjecture that manufacturing firms have little to no

regional effects. An important finding from this paper is that the overall effect in the first six to seven years may be negative.

This result is confirmed by Mueller, van Stel and Storey (2007) in their paper on firm formation and its effects of regional development in Great Britain. In particular, they look at the difference in effects of firm formation in low-enterprise and high-enterprise counties and find that the effect of firm formation on employment in low-enterprise counties is negative.

Delfmann and Sierjdan (2014) use panel data from the Netherlands to look at the effects of firm formation on employment growth in declining regions using the Fritsch model. We are particularly interested in their findings for rural areas as about two-thirds of Tanzanians live in a rural setting. Comparing the effects of firm formation in rural and urban regions, they find that there are large effects of new firms in rural areas, and that most of these effects are due to the large positive initial effects. We can then expect that the main driver of employment change will be due to the immediate effects of firm formation.

4 Data

This study employs two data sets, each created by combining data on manufacturing firms with household data either from the demographic and health surveys or the decennial census. Firm formation in Tanzania was captured using the Census of Industrial Production (CIP) which was published by the National Bureau of Statistics (2013). The CIP provides an exhaustive list of all existing firms in mainland Tanzania with more than ten employees[3]. It contains information om each firm's location, the number of employees and the year of establishment. Firms were categorized by industry with the four major groups being mining and quarrying, manufacturing, utilities, and water supply and waste management. Given that we are primarily interested in examining the impact of the manufacturing sector, we only considered firms belonging to the second group. Figure 2 shows the geo-spatial distribution of

[3] Mainland Tanzania refers to the portion of the country that is not separated from the continent by water. In other words, the Census of Industrial Production excluded firms operating on the Zanzibar archipelago.

these 1,084 manufacturing firms which will form the basis of our analysis[4]. It is evident that firms are not randomly distributed within the country. We attempt to mitigate the resulting bias by running separate regressions by rural-urban status and omitting data points in major cities as firms tend to locate in urban areas. However, given the data, it is impossible to control for this effect altogether.

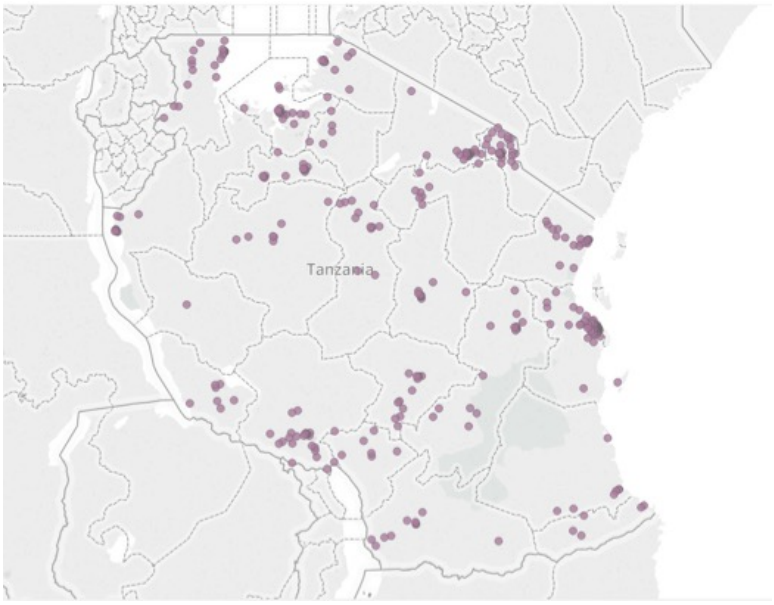

Figure 2: Distribution of manufacturing firms employing more than 10 workers.

The independent variable in both analyses was constructed using the data from the CIP. Our goal was to create an index which captured the level of firm formation in a given area. We wanted to account not only for the number of firms that were opened but also their size. Unfortunately, the census did not report the exact number of workers employed at a given firm. Instead it categorized them into five size classes: 10-19, 20-49, 50-99, 100-499, and 500+ employees. Additionally, we wanted to account for the number of firms already in existence in a district. It is undoubtedly the case that a single large firm opening in an area with several firms in operation has a lesser impact when compared to the same firm opening in an area with no preexisting firms. These considerations led us to create the index in the

[4] See Appendix for maps showing the geo-spatial distribution of firms by size.

following manner:

$$\text{index} = \frac{\sum_{i=1}^{5} s_i x_i}{\log\left(\sum_{i=1}^{5} s_i y_i\right)}$$

where s_i is the minimum bound of size class i and x_i and y_i are the number of new and prexisting firms belonging to that size class in a given district, respectively. This was modeled after the index used in Fritsch (1997) with the addition of the natural log in the denominator and an adjustment for the different sizes of firms. We found that without this adjustment the index would overemphasize the dampening effect of having a certain number of firms already operating in the area.

To get a more complete picture of the impact that industrialization has on the employment options of Tanzanians, we conducted two distinct analyses using data from different surveys. The first was at the individual level and used a series of demographic and health surveys (DHS) created by the National Bureau of Statistics and funded by USAID. The DHS program collects information on the health and welfare of women and children in the developing world. In Tanzania, thirteen of these surveys have been implemented since 1991, most of which are used to track the spread of Malaria and AIDS. However, they contain enough information for us to be able to analyze the occupational choices of men and women living in the country. It should be noted that women are slightly over-sampled due to the goals of the survey. Since the analysis required that we match respondents and firms according to their location, we could only use surveys that included a geographic identifier for everyone in the sample[5]. Thus, our data set consists of individuals who participated in the following DHS waves: 1999, 2003/2004, 2007/2008, 2009/2010 and 2011/2012[6]. The only conditions imposed on the sample were that respondents be in their prime working age and living in the mainland[7]. Furthermore, in order to preserve the independence of the observations, we selected only

[5] The government made several changes to the country's administrative boundaries in both 2002 and 2012. In order to accurately match firms and respondents to the correct district and region we geocoded the observations from the CIP and DHS and passed the resulting coordinates through a shapefile containing the most recent borders.

[6] Some of the surveys were implemented over the course of two years.

[7] We consider an individual to be of prime working age if they are older than 18 and younger than 54.

Table 1: Summary statistics for the female and male sample of the demographic and health surveys.

Variables	1999		2003/2004		2007/2008		2009/2010		2011/2012		Total	
Controls	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Age	32.25	36.25	31.93	34.28	32.79	35.33	33.09	35.44	33.40	35.80	32.81	35.31
Years of Schooling	4.48	5.81	4.93	6.23	5.08	6.18	5.23	6.23	5.37	6.48	5.11	6.25
Household Size	5.76	5.16	5.61	5.04	5.73	5.31	5.66	5.01	5.96	5.39	5.75	5.22
Rural	0.68	0.68	0.75	0.76	0.79	0.80	0.77	0.78	0.79	0.78	0.77	0.77
Outcomes												
Employed	0.87	0.97	0.92	0.99	0.91	0.99	0.88	0.98	0.93	0.99	0.91	0.99
Agriculture												
of Total	0.62	0.64	0.71	0.67	0.69	0.71	0.65	0.66	0.73	0.72	0.69	0.69
of Employed	0.72	0.66	0.77	0.68	0.76	0.72	0.73	0.67	0.79	0.72	0.76	0.70
Services												
of Total	0.03	0.03	0.16	0.15	0.17	0.10	0.05	0.06	0.07	0.06	0.10	0.09
of Employed	0.04	0.03	0.18	0.15	0.19	0.10	0.05	0.06	0.08	0.06	0.11	0.09
Professional												
of Total	0.02	0.05	0.03	0.04	0.03	0.07	0.02	0.05	0.02	0.07	0.03	0.06
of Employed	0.03	0.06	0.03	0.04	0.03	0.07	0.02	0.05	0.03	0.07	0.03	0.06
Manufacturing/Trade												
of Total	0.19	0.25	0.02	0.13	0.02	0.12	0.17	0.22	0.10	0.15	0.09	0.16
of Employed	0.22	0.25	0.02	0.13	0.02	0.12	0.19	0.22	0.11	0.15	0.10	0.16
Observations												
Total	1,685	1,301	4,167	2,930	3,961	2,497	4,678	964	5,351	3,377	19,842	11,069
Employed	1,463	1,267	3,833	2,889	3,605	2,484	4,138	962	4,974	3,354	18,013	10,956

heads of households and their spouses and conducted the analysis separately by gender.

Since our goal is to describe how individuals change jobs as firms open in their districts, we chose binary indicators of the respondents' occupation to act as our dependent variables. The DHS survey provides the occupation of each of the respondents which we broke down using the classification found in Chuhan-Pole et al. (2017). Individuals are classified as either not working or as being employed in the agricultural, services, professional or manufacturing and trades sectors. In our analysis we measured the likelihood of a respondent belonging to each category as a function of the index reported for their district and a vector of controls. These controls include the age of the respondent, a continuous measure of years of schooling, the size of their household and whether they are living in an urban or rural area of Tanzania. Summary statistics for each of the DHS waves by gender are provided above in Table 1. Notice that most of the individuals in our sample live in rural areas and are employed in agriculture. Furthermore, employment rates in the professional sector have stayed relatively

Table 2: Summary statistics for the census separated by year and gender.

	Female		Male	
	2002	2012	2002	2012
Controls				
Age	31.03	31.55	31.56	31.99
Years of Schooling	4.79	5.90	5.85	6.79
Rural	0.74	0.60	0.73	0.60
Outcomes				
Employed	0.98	0.97	0.96	0.96
Labor Force Participation	0.78	0.73	0.92	0.84
Agriculture	0.80	0.67	0.72	0.63
Services	0.10	0.15	0.10	0.11
Professional	0.06	0.10	0.08	0.11
Manual Labor	0.02	0.05	0.08	0.12
Observations	103	103	103	103

constant while those in services and manufacturing have fluctuated over the years.

The second analysis that we conducted used data from the 2002 and 2012 decennial censuses to estimate a similar effect as in the first analysis but using a different method. Since the census data had more observations we were able to control for differences in outcomes between districts. We were also able to get a more accurate measure of various employment statistics relative to the DHS since we were pooling from a much larger sample. Unfortunately, because the census is conducted infrequently, we only had data for two periods which made it harder to account for changes that occurred in the period between the samples. The variables that we used in the second analysis were roughly the same as in the first with only one exception. In addition to measuring the impact of firm formation on employment we were also able to measure the changes in labor force participation to get a more complete picture of how Tanzanians responded to the opening of new firms. The controls were also largely the same with the exception of household size which was unavailable. Summary statistics for this sample can be found in Table 2.

5 Models

5.1 DHS Model

For the individual-level analysis which used data from the DHS we ran a logistical regression model to estimate the likelihood of a respondent being employed in a particular sector as a result of firm formation. According to our hypothesis, occupational changes are a function of the level of industrialization within a district. We attempt to estimate this effect by including the firm index that we constructed in the previous section as the primary regressor in our model. Dependent variables were taken from a set of binary indicators that describe a respondent's employment status as well as their occupation. Given the structure of our data it made the most sense to pool the five DHS waves that were available and control for changes over time. The model specification that we decided upon is given as follows:

$$\log(Y_{it}) = \beta_0 + \beta_1 Index_{it} + \beta_2 X_{it} + \gamma_t + \epsilon_{it} \tag{1}$$

where X_{it} is a vector of controls that includes age and age^2, years of schooling, household size and rural-urban status and the term γ_t is meant to represent year fixed effects. In this model, the index considers the effect of only those firms that opened in the year directly before each wave.

5.2 Census Model

We use the district-level analysis to measure a similar effect as in the individual-level analysis with a modification to take advantage of the size and structure of the census data set. The DHS had too few observations per district to allow us to account for changes between geographical units. Fortunately, the census did not share this limitation. However, since data was only available for two periods, it was difficult to account for other changes that occurred during this time period. Our specification is based on a standard differences-in-differences

model but instead of a binary treatment variable we used the index to measure the intensity of treatment. The treatment group was made up of districts where new firms opened at some point between the two censuses. The control group consisted of districts where no new firms were formed. It was important to account for intensity because it was seldom the case that a district saw only a single firm start up. The model is therefore given as follows:

$$Y_{it} = \beta_0 + \beta_1 Index_i * After_t + \beta_2 Index_i + \beta_3 After_t + \beta_4 X_{it} + \delta_i + \epsilon_{it} \tag{2}$$

where *After* is a binary variables that describes whether a particular observation was taken from the 2012 census (after treatment) or taken from the 2002 census (before treatment). As before, X_{it} is a vector of controls which includes the average age and years of schooling for respondents in a given district as well as the proportion of people living in a rural area.

5.3 Limitations

Of course, no econometric model is perfect and given the quality of the data that is available on developing countries like Tanzania, there are various limitations to our approach. One such limitation that was touched upon in the previous section has to do with the fact that firms are not randomly distributed throughout the country. When choosing where to locate, businesses consider the kinds of workers that they will find in a given district. This impacts the validity of our models, especially the second which uses a differences-in-differences framework and thus relies on the assumption that the treatment is randomly administered. Future research on this topic should try to mitigate this concern using instrumental variables. Although we could not correct for this bias in our own models, research on this topic suggests that the non-random clustering of firms could mean that our results have an upward bias. Another relevant concern is reverse causality. The literature on firm formation suggests that increases in unemployment in a particular area can lead to more firm openings. However, whenever this relationship has been studied, researchers have found that the resulting firms

tend to be quite small. Tanzania in particular has a high rate of self-employment due to the lack of jobs, but the firms created as a result of this self-employment are generally small and unproductive. Since we are examining only firms with more than 10 employees, this should not introduce too much bias into our results. Lastly, data on migration was unavailable in both the census and the DHS which made it difficult to control for the fact that people may be moving as new firms start to open up in other districts. Tanzanians are very mobile; it is normal for young men to go to the city to find a job that supports their family back home. Not controlling for this could possibly bias our results. However, since we sampled only heads of households and their spouses it is unlikely that omitted variable bias is particularly severe in this case since it is usually older male sons who move to find work while the heads stay home to look over the family's agricultural plot.

6 Results and Discussion

Both of our analyses indicated that men and women react similarly when new firms commence operations in their districts. Regardless of gender, workers left the agricultural sector and transitioned into the more productive services and manufacturing sectors. Concerning the magnitude of the effect, the results were somewhat mixed but they suggested that women were more inclined to find a new job in services while men tended to find work in manufacturing. Overall employment effects for men and women were shown to be negative by our first analysis using the DHS and positive by the second using the census. Given the size of the census data and the fact that it asked respondents more precise questions about their employment status, we are more persuaded by these results.

Examining the DHS results for women given in Table 3 we see that respondents living in areas with higher levels of firm formation were more likely to not work and to leave agricultural occupations. Conversely, and in support of what we found in the literature, women were instead more likely to find employment in either services or manufacturing.

Table 3: Regression results for the DHS models of employment outcomes on index for women.

	Employed	Agriculture	Services	Professional	Manufacturing/ Trade
Index	-0.0131***	-0.0530***	0.0226***	-0.0170**	0.0180***
	(0.00197)	(0.00539)	(0.00243)	(0.00671)	(0.00253)
Age	0.0990***	-0.143***	0.175***	0.0967	0.0401
	(0.0305)	(0.0271)	(0.0337)	(0.0812)	(0.0336)
Age^2	-0.000667	0.00210***	-0.00253***	-0.000892	-0.000836*
	(0.000471)	(0.000402)	(0.000494)	(0.00119)	(0.000501)
Years of Schooling	0.0535***	-0.188***	0.0601***	0.508***	0.0233**
	(0.00922)	(0.00930)	(0.00987)	(0.0226)	(0.00942)
Household Size	0.0150	0.106***	-0.0808***	-0.0141	-0.0743***
	(0.0101)	(0.0113)	(0.0132)	(0.0279)	(0.0133)
Rural	1.257***	2.523***	-2.079***	-0.786***	-1.998***
	(0.0697)	(0.0598)	(0.0733)	(0.147)	(0.0760)
2003/2004	0.733***	0.195*	2.423***	0.0776	-2.725***
	(0.121)	(0.107)	(0.221)	(0.261)	(0.157)
2007/2008	0.512***	-0.0697	2.669***	0.0623	-2.775***
	(0.122)	(0.107)	(0.222)	(0.269)	(0.166)
2009/2010	0.343***	-0.143	0.799***	-0.591**	0.0410
	(0.118)	(0.103)	(0.230)	(0.259)	(0.0986)
2011/2012	0.636***	0.224**	1.340***	-0.456*	-0.618***
	(0.122)	(0.106)	(0.229)	(0.273)	(0.106)
Constant	-1.763***	2.194***	-5.406***	-8.716***	-0.237
	(0.476)	(0.431)	(0.583)	(1.350)	(0.531)
Observations	19,842	18,013	18,013	18,013	18,013
R^2	0.098	0.353	0.264	0.356	0.268

This suggests that the entry of manufacturing firms, whose workers are more productive and earn higher wages, raises the opportunity cost of women staying in the primary sector. Previous research shows that it is not difficult to enter the services and manufacturing sectors, so it is not surprising to see that women respond in this way to these new wage incentives. Looking again at Table 3 we note that firm formation has a larger impact on employment in services as compared to manufacturing, even though the relationship is positive for both. This confirms findings in the mining literature where researchers have found that the influx of workers into a new mining town increases the demand for certain services that women are more apt to provide. The same effect might explain what we see here with firm formation. Lastly, note that the change in the employment of women is negative in the regression table. We believe that this may be indicative of the fact that, because womens' employment decisions are made in conjunction with those of the other household members, higher wages in manufacturing allow males to earn more and give women the opportunity to stay home. Evidence that this is indeed the case comes from observing the coefficient on the variable household size which tells us that women with larger families are less likely to be employed in services and manufacturing and more likely to work in agriculture (often at home).

Looking now at the results from the male sub-sample of the DHS (Table 4), we find that the effects of firm formation on employment outcomes are largely the same as what we saw for females. While the likelihood of being employed in general and in agriculture are negatively related to increases in firm formation, the opposite is true when it comes to services and manufacturing. One interesting difference between the sexes is that men were found to be relatively more likely to work in manufacturing compared to services, while the opposite was true for women. In the mining literature researchers found similar results whereby the opening of a mine in a particular area increased male employment in mining and female employment in services. One unexpected finding from the regression output was that firm formation decreased the likelihood of men being employed overall. There are various reasons for why this may be the case including the fact that new firms increase the level of

Table 4: Regression results for the DHS models of employment outcomes on index for men.

	Employed	Agriculture	Services	Professional	Manufacturing/ Trade
Index	-0.0109**	-0.0722***	0.0129***	0.00556	0.0148***
	(0.00499)	(0.00920)	(0.00262)	(0.00417)	(0.00235)
Age	0.378***	0.0377	-0.0205	-0.0406	0.0229
	(0.109)	(0.0376)	(0.0467)	(0.0713)	(0.0399)
Age^2	-0.00515***	-0.000223	3.02e-05	0.000945	-0.000678
	(0.00151)	(0.000529)	(0.000663)	(0.000986)	(0.000561)
Years of Schooling	-0.0770*	-0.231***	0.0309***	0.314***	0.0382***
	(0.0396)	(0.0121)	(0.0117)	(0.0220)	(0.0103)
Household Size	0.0522	0.0543***	-0.0214	-0.0483**	-0.0416***
	(0.0392)	(0.0136)	(0.0184)	(0.0240)	(0.0150)
Rural	0.602*	2.397***	-1.865***	-0.349**	-1.848***
	(0.309)	(0.0761)	(0.0949)	(0.136)	(0.0783)
2003/2004	0.735**	-0.0554	2.138***	-0.308*	-0.890***
	(0.322)	(0.111)	(0.217)	(0.187)	(0.114)
2007/2008	1.641***	-0.0531	1.813***	0.189	-0.839***
	(0.392)	(0.115)	(0.223)	(0.185)	(0.116)
2009/2010	2.681***	-0.441***	1.103***	-0.156	0.141
	(0.789)	(0.137)	(0.262)	(0.228)	(0.135)
2011/2012	1.562***	0.125	0.997***	0.134	-0.460***
	(0.359)	(0.113)	(0.229)	(0.199)	(0.110)
Constant	-3.115*	-0.523	-2.227***	-4.538***	-0.0155
	(1.648)	(0.644)	(0.797)	(1.225)	(0.674)
Observations	11,069	10,956	10,956	10,956	10,956
R^2	0.103	0.357	0.190	0.194	0.185

competition in the local economy making it more difficult for small firms, and therefore their owners, to survive in the market. Unfortunately, we cannot test this hypothesis without more detailed data on entrepreneurship in Tanzania although qualitative descriptions of the business climate in the country suggest that it is common for people to start their own firms.

We see the same patterns as before when looking at results from the census data analysis with a few notable exceptions. It is important to note while reading this portion of the paper that while the two models capture the same general effect they are not strictly comparable. The first analysis looks at the likelihood that an individual chooses a particular occupation while the second examines the proportion of people in a district employed in a given sector. Another point of importance is that the DHS models look at firms opening in the previous year while the census model measure the effect of the treatment (i.e. the number of firms) opening within a ten-year period.

Table 5: Census regression results of employment outcomes on index for women.

	Employed	Labor Force Participation	Agriculture	Services	Professional	Manufacturing/ Trade
After	-0.00296	-0.00544	-0.0949***	0.0153	0.0363***	0.0114**
	(0.00462)	(0.0328)	(0.0206)	(0.0115)	(0.00827)	(0.00498)
After * Index	0.000195***	0.000371***	-0.000198**	0.000136*	-3.10e-05	0.000156***
	(2.33e-05)	(0.000113)	(8.66e-05)	(7.27e-05)	(5.02e-05)	(4.57e-05)
Age	0.00626**	0.0203	0.0636***	-0.0237***	-0.0182***	-0.00517
	(0.00308)	(0.0147)	(0.0120)	(0.00604)	(0.00661)	(0.00354)
Years of Schooling	-0.00321	-0.0325	-0.0213	0.0124	0.00599	0.00612
	(0.00494)	(0.0271)	(0.0159)	(0.0129)	(0.00697)	(0.00553)
Rural	0.0325	0.164**	0.299***	-0.199***	-0.0465	-0.0281
	(0.0214)	(0.0775)	(0.0704)	(0.0468)	(0.0292)	(0.0213)
Constant	0.773***	0.181	-1.288***	0.920***	0.631***	0.176
	(0.111)	(0.526)	(0.419)	(0.241)	(0.219)	(0.136)
Observations	206	206	206	206	206	206
R-squared	0.383	0.376	0.856	0.727	0.694	0.699

As in the DHS regressions, the census regressions for women (Table 5) report a negative relationship between levels of firm formation and agricultural employment. In addition, we see that female employment in services and manufacturing increases as new firms open in a given district. Interestingly, the results from the second model depart from those of the first in that the size of the employment change for women in manufacturing is larger than that for services. While it is not immediately obvious why we are seeing this change, it could be because of the addition of district-fixed effects in the second model. This would suggest that the level of female employment in the services and manufacturing sector is dependent on location. Another major difference between the two models is the increase in overall employment for women associated with an increase in the number of firms. Since the census is a larger data set and it captures the employment rate more accurately, we give more weight to these results. One of the benefits of using the census data is that we can measure labor force participation. For women in particular we see a positive effect of firm formation on labor force participation. This may be an indication that the opportunity cost of not working increases when new jobs are available in more productive sectors like manufacturing or services.

In the census regressions for males (Table 6) we see an increase in overall employment, as well as an increase in employment in the manufacturing sector as a result of new firm formation. However, in contrast to the DHS results, employment in services has a negative coefficient. This goes against the predictions we made earlier in the paper where we expressed the belief that both manufacturing and services employment would increase regardless of sex. Interestingly, the coefficient on agriculture is insignificant even though there is a clear decrease in the proportion of men who are employed in agriculture between 2002 and 2012 (Table 2). As we mentioned at the start of this section, an important difference between the census and the DHS models is that the latter captures the effects of firm formation after a year and the former captures the effect over 10 years. In other words, we are looking at averaged out effects in the second model (census), but more direct effects in the first model

Table 6: Census regression results of employment outcomes on index for men.

	Employed	Labor Force Participation	Agriculture	Services	Professional	Manufacturing/ Trade
After	0.00817	-0.0403***	-0.0485**	-0.00768	0.0239***	0.00616
	(0.00813)	(0.0121)	(0.0194)	(0.00999)	(0.00654)	(0.00802)
After * Index	0.000191***	-6.22e-05	-1.55e-05	-0.000194***	-2.66e-05	0.000282***
	(4.75e-05)	(6.67e-05)	(8.92e-05)	(6.90e-05)	(6.81e-05)	(6.53e-05)
Age	-0.000696	0.0191**	0.0409***	-0.0139**	-0.000507	-0.0141***
	(0.00528)	(0.00808)	(0.0120)	(0.00586)	(0.00532)	(0.00510)
Years of Schooling	-0.000556	-0.0500***	-0.0159	0.00609	0.00750	0.00949
	(0.0101)	(0.0114)	(0.0209)	(0.0145)	(0.00724)	(0.0100)
Rural	0.0403	-0.0529	0.380***	-0.179***	-0.0370	-0.134***
	(0.0343)	(0.0355)	(0.0802)	(0.0484)	(0.0347)	(0.0345)
Constant	0.952***	0.647**	-0.755*	0.636***	0.0768	0.570***
	(0.204)	(0.274)	(0.430)	(0.226)	(0.192)	(0.210)
Observations	206	206	206	206	206	206
R-squared	0.195	0.830	0.734	0.405	0.597	0.716

(DHS). These results might then suggest that women are more sensitive to shocks - like new firm openings - and that the effects are persistent over time while the same is not the case for men.

6.1 Robustness Checks

6.1.1 Urban-Rural Status

As firms tend to cluster in urban areas, we repeated the regressions separately for urban and rural districts to test whether the results were being driven by the potential correlation between the constructed index and rural-urban status. This clustering effect should have been taken into account by the index, but this is a useful robustness check, especially since the particular construction of our index is unique to the paper. We report the coefficients of the index for all the outcomes below (Table 7).

Table 7: Regression results for both models by urban-rural status

	Rural					
	Employed	Labor Force	Agriculture	Services	Professional	Manufacturing/ Trade
Females (DHS)	-0.0390***	-	-0.0383***	0.0338***	-0.0574	0.0352***
	(0.00481)		(0.00624)	(0.00615)	(0.0517)	(0.00651)
Males (DHS)	-0.0326**	-	-0.0539***	0.0383***	0.0329***	0.0200***
	(0.0135)		(0.0101)	(0.00603)	(0.00781)	(0.00514)
Females (Census)	-4.85e-06	-0.000255	-6.77e-05	0.000338	2.37e-05	0.000110*
	(5.46e-05)	(0.000408)	(0.000291)	(0.000306)	(0.000141)	(5.75e-05)
Males (Census)	-2.75e-05	-0.000398	-9.75e-06	0.000182	-3.06e-05	0.000373*
	(0.000104)	(0.000415)	(0.000158)	(0.000155)	(0.000141)	(0.000194)
	Urban					
	Employed	Labor Force	Agriculture	Services	Professional	Manufacturing/ Trade
Female (DHS)	-0.00877***	-	-0.0698***	0.0213***	-0.0120**	0.0186***
	(0.00206)		(0.00954)	(0.00267)	(0.00581)	(0.00273)
Male (DHS)	-0.00882*	-	-0.0986***	0.00882***	-0.00135	0.0151***
	(0.00466)		(0.0168)	(0.00271)	(0.00458)	(0.00256)
Female (Census)	0.000157***	0.000274*	1.84e-05	7.66e-05	-7.15e-05	1.24e-05
	(3.68e-05)	(0.000146)	(0.000128)	(0.000127)	(5.47e-05)	(3.31e-05)
Male (Census)	0.000126*	0.000143**	-0.000137	-2.32e-05	-2.87e-05	0.000169*
	(6.14e-05)	(5.91e-05)	(0.000171)	(9.75e-05)	(8.85e-05)	(8.64e-05)

Running the regressions separately for urban and rural areas with the census data did not yield many significant results. This is likely due to the fact that the data set was collapsed to district-level data, and very few districts are strictly rural or urban. For the purposes of this regression, we defined a district as rural if more than 50% of the inhabitants of the district reported living in rural areas in both 2002 and 2012. The only significant coefficient for the rural districts under the census model were for manufacturing, which was positive and significant across both genders. These results are consistent with the original model. For

urban districts, the coefficients on overall employment and labor force participation were both positive and significant regardless of gender. These results are consistent with the original analysis, the only exception being labor force participation, which was originally insignificant for women.

On the other hand, the urban-rural analysis for the DHS data yielded more significant results which were consistent with earlier findings from the model. We see that firm formation has a negative effect on overall employment as well as on employment in agriculture regardless of urban-rural status and gender. Similarly, firm formation has a positive effect on employment in manufacturing across urban-rural status and gender.

Finally, regressions for both the models that excluded major urban areas such as Dar es Salaam were consistent with the results from the original regressions that we reported in the previous section across males and females.

6.1.2 Lags

A critique of some of the firm formation literature is that lags between firm formation and their effects are not taken into account. However, the lack of competition in the manufacturing sector in Tanzania makes it likely that these lags are either small or do not exist since we do not expect to see the supply-side effects predicted by Fritsch (1997). However, we wanted to check for varying effects over time in case these supply-side effects are created following firm formation.

The structure of the census data does not lend itself to the kind of lag analysis reported in the literature, but we were able to check for lagged effects using the DHS data. We tested up to nine years of lags as suggested by the literature. We first tested each lag separately, and then all together as in Fritsch and Mueller (2004).

We found that considering the effect of firm formation i years ago, where i runs from 1 to 9, maintains significance and the same direction as in the main analysis on all outcomes, i.e. the effect of firm formation i years ago on current employment and agriculture is negative

and significant, while this effect is positive for current employment in manufacturing and services. The only exception to this trend was overall employment for males, which stopped being significant after 5 lags. This is to say that new firm formation 6 or more years ago did not have a statistically significant effect on overall male employment. The remainder of the results were consistent across both genders. These results reflect the findings of Fritsch and Mueller (2004), who report that considering each lag separately maintains significance in the same direction as the main analysis. They attribute this pattern to the high correlation in their independent variable (start-up rate at time $t - i$) between the years.

On the other hand, considering all the lags together did not result in any consistent patterns, with most lag coefficients being insignificant for males and females. The only exception was the effect of firm formation on agriculture for males, which was consistently negative and significant for most lags. This is in stark contrast to the findings Fritsch (1997), Fritsch and Mueller (2004), and Mueller, van Stel and Storey, who find a statistically significant pattern when considering firm formation and lagged effects on employment. These findings are in line with our prediction that the main effect of firm formation on employment would be due to direct employment effects at the time of firm entry. The most likely explanation is that the lagged effects are a function of the supply-side effects of firm formation, which are limited in Tanzania due to its size and relative lack of competition. Another explanation might be that the index used in our model is different than the adjusted start-up rates used in the literature, which might affect the results. Finally, we did not use an alternative method to account for the collinearity of lagged indices, which is a concern in the literature. However, the nature of the index resulted in a relatively low correlation between the years (30%), while the authors using start-up rates usually reported having a correlation of upwards of 90% between the years. Therefore, this is not a major concern for this paper.

6.1.3 Index Construction

We constructed the index by modifying the index in Fritsch (1997) to suit the needs of the questions and models under consideration, which means that our index has not been previously tested. Therefore, it was important to conduct robustness checks on the index by changing its form to see whether it was the specific construction of the index that was driving the results.

Most of the specifications for the index were eliminated initially as they weighted pre-existing firms too heavily, but the main one that was comparable to the index used in the paper was the natural log of the index. The second construction was intended to account for possible non-linear effects of the different size brackets of firms. The logged index produced similar results in terms of the direction and significance of the coefficients of the index across urban-rural status and gender. However, the magnitude of the coefficient on the logged index was much larger than we believed to be plausible for both men and women, but only when we used the DHS data. The regression tables for the logged index can be found in the appendix.

One possibility is that the logged index decreased the scale of the treatment so that the relative difference in intensity of firm formation was not accurately captured. As the DHS model uses individual-level data, it would be more sensitive to this inaccuracy. Since both the indices weighed the level of new firm formation similarly, we chose to mainly report the findings using the unlogged index. However, the stability in results with regards to sign and significance indicates that the direction of the results are clear even if the exact magnitude might not be.

7 Conclusion

The aim of our paper was to investigate the effects of firm formation on the employment outcomes of Tanzanians. The results suggest that as new firms open up in a district, workers

in that district tend to move out of agriculture and into manufacturing and services regardless of sex. The effect on overall employment was ambiguous. While the DHS model suggests that individuals are less likely to work following the formation of new manufacturing firms, the census model suggests the opposite. We also found conflicting results with regards to employment in services for women. While the DHS results suggest that women tend to move into services more so than into manufacturing, the census results showed no such difference in their occupational decisions. On the other hand, men tend to move more so towards manufacturing as compared to services. This result was consistent across all of our regressions. Finally, we find that the main results are consistent across rural-urban status, and that there are no significant lagged effects.

Studying the effects of firm formation on employment and occupational changes are important in understanding how the lives of Tanzanians are changing. However, we would ideally hope to capture the overall change in the well-being of Tanzanians as a result of firm formation. Evidence from other countries shows that as the workforce moves into the secondary and tertiary sectors, standards of living increase. This provides an avenue for further research to see whether firm formation is associated with other socio-economic indicators such as increased access to resources, which would indicate that Tanzania is headed in a similar direction.

Lastly, the livelihoods of the poor in Tanzania, or elsewhere, are complex in ways we cannot capture in a singular analysis of firm formation on occupational changes. Future research should move beyond a framework of strictly analyzing relationships through statistical models to one that provides a deeper understanding of the context in which individuals and households make decisions to improve their well-being.

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9 Appendix

9.1 Clustering of Firms by Size

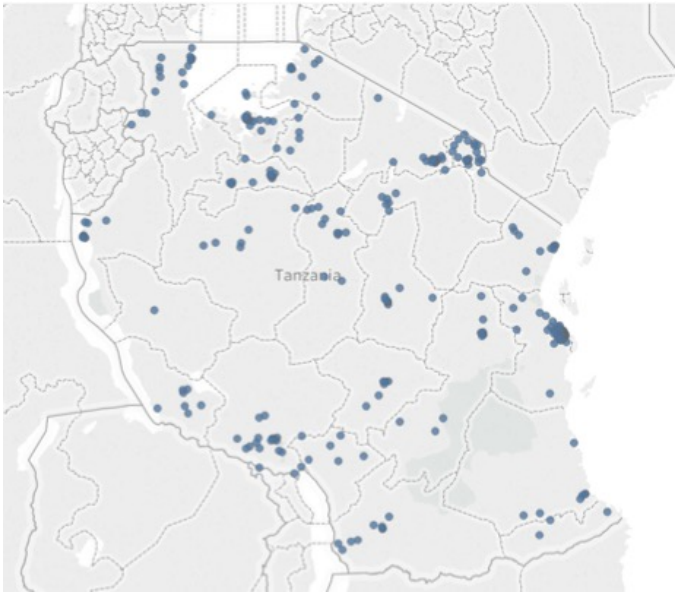

Figure 3: Distribution of firms with between 10 and 100 employees.

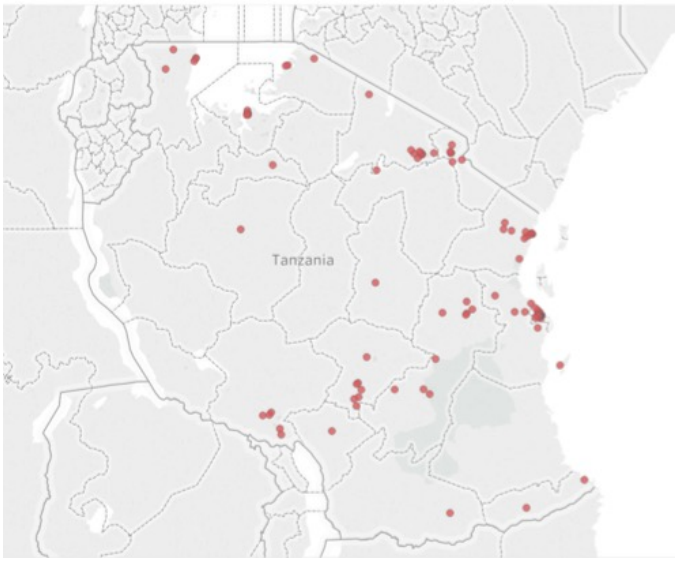

Figure 4: Distribution of firms with more than 100 employees.

9.2 Regressions Using Log Index

Table 8: Regression results for the female-DHS analysis using log of index.

	Employed	Agriculture	Services	Professional	Manufacturing/ Trade
Index	-0.269***	-0.599***	0.373***	-0.0912	0.258***
	(0.0323)	(0.0338)	(0.0307)	(0.0604)	(0.0381)
Age	0.147***	-0.0776**	0.176***	-0.0130	-0.0466
	(0.0366)	(0.0302)	(0.0356)	(0.0713)	(0.0382)
Age^2	-0.00136**	0.00111**	-0.00252***	0.000830	0.000249
	(0.000564)	(0.000440)	(0.000521)	(0.00103)	(0.000558)
Years of Schooling	0.0398***	-0.187***	0.0355***	0.462***	0.0303**
	(0.0118)	(0.0106)	(0.0105)	(0.0224)	(0.0118)
Household Size	-0.00378	0.0829***	-0.0729***	-0.00911	-0.0448***
	(0.0113)	(0.0122)	(0.0140)	(0.0262)	(0.0156)
Rural	1.294***	2.330***	-1.994***	-0.748***	-1.702***
	(0.0959)	(0.0660)	(0.0820)	(0.152)	(0.0990)
2003/2004	-0.896***	0.257**	2.873***	-0.145	-2.847***
	(0.259)	(0.111)	(0.229)	(0.204)	(0.156)
2007/2008	-1.122***	0.0475	3.094***	-0.177	-2.914***
	(0.259)	(0.111)	(0.230)	(0.205)	(0.165)
2009/2010	2.648***	-0.412***	1.135***	-0.381	0.160
	(0.793)	(0.135)	(0.281)	(0.263)	(0.134)
2011/2012	-1.000***	0.308***	1.756***	-0.644***	-0.800***
	(0.259)	(0.110)	(0.234)	(0.220)	(0.109)
Constant	-0.608	1.447***	-5.976***	-6.509***	1.114*
	(0.610)	(0.499)	(0.614)	(1.199)	(0.633)
Observations	15,744	14,641	14,641	14,641	14,641
R^2	0.1380	0.3526	0.2735	0.3173	0.2673

Table 9: Regression results for the male-DHS analysis using log of index.

	Employed	Agriculture	Services	Professional	Manufacturing/ Trade
Index	-0.150***	-0.608***	0.214***	0.0101	0.233***
	(0.0441)	(0.0336)	(0.0323)	(0.0641)	(0.0276)
Age	0.134***	-0.0870***	0.0155	0.0500	0.0890***
	(0.0469)	(0.0306)	(0.0429)	(0.0741)	(0.0321)
Age^2	-0.00132*	0.00146***	-0.000459	-0.000436	-0.00149***
	(0.000716)	(0.000441)	(0.000614)	(0.00105)	(0.000466)
Years of Schooling	0.0602***	-0.215***	0.0575***	0.350***	0.0240***
	(0.0140)	(0.0101)	(0.0108)	(0.0231)	(0.00864)
Rural	0.845***	2.450***	-1.691***	-0.388***	-1.909***
	(0.111)	(0.0646)	(0.0920)	(0.142)	(0.0697)
Household Size	0.0321*	0.0853***	-0.0350**	-0.0521**	-0.0643***
	(0.0171)	(0.0121)	(0.0165)	(0.0246)	(0.0123)
2003/2004	2.379***	-0.0683	1.804***	0.0394	-0.805***
	(0.201)	(0.111)	(0.212)	(0.244)	(0.114)
2007/2008	3.263***	-0.0460	1.457***	0.551**	-0.759***
	(0.307)	(0.116)	(0.219)	(0.244)	(0.117)
2009/2010	0.348***	-0.122	0.721***	-0.293	0.0159
	(0.112)	(0.106)	(0.216)	(0.238)	(0.0976)
2011/2012	3.134***	0.121	0.610***	0.477*	-0.381***
	(0.283)	(0.114)	(0.227)	(0.255)	(0.110)
Constant	-2.036***	1.464***	-2.819***	-6.550***	-1.234**
	(0.735)	(0.503)	(0.730)	(1.255)	(0.522)
Observations	15,167	14,328	14,328	14,328	14,328
R^2	0.1997	0.3729	0.1940	0.2429	0.2019

Table 10: Regression results for the female-census analysis using log of index.

	Employment	Labor Force Participation	Agriculture	Service	Professional	Manufacturing/ Trade
After	-0.00558	-0.00960	-0.0904***	0.0137	0.0351***	0.00814
	(0.00466)	(0.0335)	(0.0208)	(0.0119)	(0.00835)	(0.00507)
After * Index	0.00449***	0.00748	-0.00694**	0.00291	0.00135	0.00503***
	(0.00108)	(0.00461)	(0.00350)	(0.00211)	(0.00171)	(0.000900)
Age	0.00706**	0.0223	0.0638***	-0.0230***	-0.0193***	-0.00516
	(0.00305)	(0.0143)	(0.0119)	(0.00598)	(0.00656)	(0.00341)
Years of Schooling	-0.00278	-0.0307	-0.0195	0.0129	0.00399	0.00512
	(0.00525)	(0.0270)	(0.0167)	(0.0130)	(0.00722)	(0.00550)
Rural	0.0414**	0.185**	0.299***	-0.192***	-0.0556*	-0.0263
	(0.0196)	(0.0761)	(0.0688)	(0.0462)	(0.0290)	(0.0204)
Constant	0.740***	0.0951	-1.304***	0.892***	0.680***	0.180
	(0.113)	(0.513)	(0.415)	(0.237)	(0.218)	(0.134)
Observations	206	206	206	206	206	206
R^2	0.344	0.365	0.859	0.725	0.696	0.728

Table 11: Regression results for the male-census analysis using log of index.

	Employment	Labor Force Participation	Agriculture	Services	Professional	Manufacturing/ Trade
After	0.00772	-0.0366***	-0.0481**	-0.00531	0.0218***	0.00408
	(0.00852)	(0.0123)	(0.0192)	(0.0105)	(0.00648)	(0.00820)
After * Index	0.00399**	-0.00510**	-0.000614	-0.00612***	0.00174	0.00743***
	(0.00158)	(0.00197)	(0.00384)	(0.00197)	(0.00181)	(0.00161)
Age	-0.000819	0.0194**	0.0410***	-0.0136**	-0.000654	-0.0143***
	(0.00539)	(0.00763)	(0.0119)	(0.00567)	(0.00528)	(0.00524)
Years of Schooling	-0.00133	-0.0453***	-0.0155	0.00931	0.00490	0.00654
	(0.0102)	(0.0109)	(0.0218)	(0.0144)	(0.00760)	(0.0101)
Rural	0.0482	-0.0403	0.381***	-0.179***	-0.0473	-0.128***
	(0.0331)	(0.0325)	(0.0801)	(0.0474)	(0.0338)	(0.0359)
Constant	0.955***	0.600**	-0.759*	0.608***	0.104	0.592***
	(0.210)	(0.261)	(0.426)	(0.227)	(0.190)	(0.213)
Observations	206	206	206	206	206	206
R^2	0.162	0.839	0.734	0.422	0.600	0.716