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Income diversification, market participation and urban proximity as determinants of exit from rural poverty: Evidence from Ethiopia and Tanzania

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Abstract

It seems unlikely that Sub-Saharan Africa can follow the Asian experience of structural transformation through export-led growth. Rather, it has to rely on domestic sources to achieve substantial reductions in poverty. One such driver could be growing urban populations with increasing demand for rural products and services. This thesis explores detailed panel data as to whether non-agricultural household enterprises and agricultural market participation allow Ethiopian and Tanzanian households to tap into this emerging demand. It is found that starting an enterprise increases some of the studied measures of consumption, yet only in the vicinity of large towns. Marketing instead of consuming crops has no effect on consumption levels. The first result suggests that there are large gains to be achieved from lifting the constraints holding back the rural non-farm economy in less remote areas. It also underlines the need for development policy to consider the economic geography of the countries concerned. The second finding demands caution in encouraging market participation of smallholder farmers.

Keywords: Market participation, household enterprises, structural transformation, economic geography, Ethiopia, Tanzania
JEL: O12, O14, O18, Q13

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1 Introduction

In the face of decreasing commodity prices and a sluggish global economic environment, it seems unlikely that Sub-Saharan Africa (hereafter Africa) can follow the Asian experience of structural transformation through export-led growth. Rather, it has to rely on domestic sources to achieve substantial reductions in poverty. One such driver could be growing urban populations with increasing demand for rural products and services. With poverty on the continent looking set to remain agricultural and rural for decades to come, it is important to understand which strategies allow rural households to tap into this demand.

Much of the scientific debate on rural-urban linkages and structural transformation in Africa has been theoretic (Gollin and Rogerson, 2014; Haggblade et al., 2010), macro-model-based (Dorosh and Thurlow, 2014, 2013; Adam et al., 2016; Diao and McMillan, 2015), or empirically on a cross-country level (Henderson et al., 2013; Christiaensen et al., 2011). However, studies econometrically examining the poverty impact of household-level strategies in the context of urban proximity and remoteness have been less frequent (Vandercasteelen et al., 2016; Neven et al., 2009). Furthermore, research has often looked in a dichotomous way at rural and urban areas, thus neglecting different degrees of remoteness. This thesis provides econometric evidence on whether the consumption effects of agricultural market participation (AMP) and engagement in non-agricultural household enterprises (NAHE) are similar across the geographic space of Ethiopia and Tanzania, or whether proximity effects let these strategies only be beneficial in the vicinity of urban areas.[1] Such effects could, similar to the Asian experience, be a direct demand for goods and services from rural areas, as well as spillovers of overall urban economic activity (Masters et al., 2013). Indeed, Darrouzet-Nardi and Masters (2015) show that children from rural areas with longer experiences of urbanization in the vicinity suffer less from under- and malnourishment, and Collier and Dercon (2014) state demand emanating from urban areas into the hinterlands as characteristic of future African economies if development is to succeed. These characteristics are taken up in the model by Gollin and Rogerson (2014) which implies rural-urban linkages of decreasing intensity as distance increases, limiting business opportunities for remote households.

Related previous studies on these strategies have often either not had the benefit of detailed data to substantiate their arguments (for agriculture: Tiffen, 2003; Dorosh and Thurlow, 2013; for non-farm enterprises: Haggblade et al., 2010), did not consider the economic geography of the strategies (for

[1] For the purposes of this paper, agricultural market participation is defined as crop production being marketed instead of consumed within the household, while non-agricultural self-employment comprises the operation of a non-agricultural business whose organizational base is the household.

agriculture: Oseni et al., 2014; Christiaensen et al., 2011; van Campenhout, 2015; Ricker-Gilbert et al., 2014; for non-farm enterprises: Bezu et al., 2012) or did not look at poverty outcomes (for non-farm enterprises: Nagler and Naudé, 2017). This could result in development strategy recommendations not being fine-tuned to certain geographical areas or overestimating the poverty impacts of the two strategies. The following research questions are thus posited:

- Does AMP and running a NAHE increase components of household consumption?
- Is distance to urban markets a relevant determinant of AMP and running a NAHE?
- Do their effects on consumption depend on the proximity to urban markets?

A clearer picture of which diversification strategies work where will help the scientific community understand transformation processes in rural Africa better. It will also support policy makers decide where to geographically allocate scarce resources for which policies. To this end, successive rounds of the Living Standards Measurement Survey - Integrated Survey on Agriculture (LSMS-ISA) will be analyzed, allowing to control for time-invariant household characteristics and specific shocks affecting the household. Two measures of poverty are employed, namely food consumption per adult equivalent in the household as a short term indicator (Deaton, 1997) and non-food expenditure of the household as more long-term and less price-affected one.

It is found that AMP does not lead to increased consumption in any region of the countries studied. However, running a NAHE increases non-food consumption in Ethiopia, and there is evidence for effects on food consumption. In Tanzania, it raises food, but not non-food consumption. Despite households not preferentially selecting to engage in NAHE and AMP by distance to large population centers, the positive results found are driven by households in the most proximate areas, indicating low profitability of NAHEs in more remote areas. In Ethiopia, entry into NAHEs holds particularly high returns for landless households, but is also a gainful diversification strategy for farmers. It is furthermore shown that large towns are the more important reference points for determination of payoffs than the respective primary city or the closest market town, suggesting that the presence of urban demand is important, but emanating from more cities than just the primary ones. Moreover, results show that consumption gains from engaging in NAHE are not maintained over time, indicating the high fluctuation in business activities.

The remainder begins with Section 2 looking in more detail at the literature on economic transformation across space with a focus on Africa, as well as the role of AMP and NAHE in rural economies.

Section 3 summarizes this evidence into a conceptual framework and defines the thesis' contribution, before Section 4 presents relevant background information on the studied countries. Section 5 presents the data, describes the construction process of variables used, and presents the econometric approach. Section 6 shows the main quantitative results before Section 7 explores their robustness. Section 8 discusses the results and limitations of the study. Section 9 concludes.

2 Economic development across space

The following section presents the multiple angles researchers have used to shed light on the topic of this thesis. In the absence of broad comparative studies and a unified framework, it will cover extensively the different methodological approaches employed, starting with the more conceptual work before turning to micro-evidence.

An early but still useful formalization of the allocation of economic activities across space is von Thünen's land-use model (1842), where agricultural ventures are sorted in concentric circles around large urban markets, depending on their products' perishability and transport cost. Regions close to cities produce high-value goods like dairy and legumes for urban consumption, while more remote areas provide staple foods that can be transported in bulk. As distance grows, transport costs become prohibitively large and farmers engage in subsistence farming or migrate closer to the agglomeration. Fafchamps and Shilpi (2001) find this pattern confirmed in Nepal with non-agricultural employment appearing more prevalent around cities. There are only scant applications of the model to African contexts,[2] though McCall (1985) finds that agricultural production is relatively dispersed as cities are in many countries a recent phenomenon. Peasant agglomerations could thus be beneficial for a more efficient use of inputs and increased market access.

A related argument comes from Lewis (1954), whose model of economic development in poor countries is based on a dualism between a subsistence sector characterized by 'unlimited' supplies of labor and a capital-intensive modern sector. However, Lewis did not see the rural-urban or industry-agriculture divides overlapping with the modern-subsistence dichotomy. Rather, modern sectors could also be located in rural areas practicing agriculture or associated industries. Together with urban areas, these would be nuclei of structural transformation.

Evidence for this being the case comes from Darrouzet-Nardi and Masters (2015) who, through the analysis of 83 Demographic and Health Surveys, show that children's health status tends to be better

[2] An early exception for Ethiopia is Horvath (1969).

in the vicinity of cities. The authors argue that this reflects improved marketing opportunities for rural households, which in turn protect households from production shocks, allows consumption smoothing and access to non-farm employment, ultimately leading to better health and welfare outcomes.

Given the continued reliance of many African countries on the agricultural sector and resource exports, a relevant question is how the economic geography would have to change to support more productive industries. Collier and Dercon (2014, p. 92) identify five transformations necessary to decrease poverty over the next 50 years: "a vast reduction in the number of people engaged in agriculture, [...] a massive increase in the urban population and coastal population, [...] in rural areas, a vast reduction of the size of the population living in areas relatively far away from urban areas and from the coast, [...] a considerable increase in labor productivity in agriculture, [...] and a considerable increase in overall agricultural production". While migration is obviously an important part of this transformation, rural economies will also need to change. The authors argue for a more open-minded approach to agriculture allowing for organizational models other than the smallholder farm. The envisaged medium-sized agricultural enterprises are likely to generate demand for associated rural services, allowing more local value creation. At the same time, such activities will have to be located close to cities and ports while remote regions are likely to be last and least affected by economic growth.

This line of thinking suggests a subdivision of rural areas according to their remoteness from urban hubs. Such a disaggregated analysis is attempted in studies by Dorosh and Thurlow (2014, 2013) who through economy-wide models show how investments in cities, small towns or rural areas affect sectoral allocation and poverty distributions in Ethiopia and Uganda. The importance of medium-sized agglomerations is generally underlined, as these have the strongest linkages with surrounding rural areas where the majority of the population continues to reside. While investment in urban areas can drive structural transformation on aggregate, the capital intensity of industries there makes for a limited impact on poverty. It remains unclear though which demand stimuli beside public spending should make small towns the drivers of transformation.

The usefulness of a more fine-grained geographical distinction is underlined through the findings by Beegle et al. (2011) and Christiaensen et al. (2013), who analyze a 20-year panel from Tanzania. They show that poverty impacts of migration are largest for individuals joining the rural non-farm economy in secondary towns, whereas migrants to the two largest cities experience large rises in consumption but, because of higher prices, remain in poverty longer. This finding is generally confirmed in a subsequent cross-country study (Christiaensen and Todo, 2014).

2.1 The rural economy and its linkages to urban areas

The following subsections will have a closer look at key elements of the rural economy. Rural households derive their incomes from a multitude of sources. Estimates from numerous household surveys suggest a continued strong reliance of African households on agricultural incomes (63% vs. 33% other world regions), while those households moving towards the non-farm sector in Africa are generally better off (Davis et al., 2014). Therefore multiple strategies exist for welfare improvement on the household level which can be classified into migration, agriculture-based, and the rural non-farm economy (World Bank, 2008, p. 73). The latter two and their linkages to urban areas are the focus of the following.[3]

2.1.1 Agriculture - market participation as a rational strategy?

An ongoing debate concerns the benefits of and constraints to market participation of smallholder farmers. It is generally found that, due to various constraints, African farmers take less than half of their produce to the market. Van Campenhout (2015) finds that only a quarter of maize- and bean-growing smallholders in Mozambique and Uganda consistently market their harvest. Market participation is determined by land holdings and gender, but not by market accessibility. Relatedly, Olwande et al. (2015) find that consistent market participation rates remained below 30% for maize, the kale vegetable and milk in a panel sample of Kenyan farmers between 1997 and 2010. Between 51% (milk) and 58% (maize) of households do sell their crop at some point over the observation period, indicating low reliability of markets for both buyers and sellers. The authors argue that this is partly driven by unreliable rainfall, a finding underlined by Mather et al. (2013). By analyzing a panel of maize farmers from Zambia, Mozambique and Kenya through double-hurdle models, they furthermore find that increased market access does not translate into higher participation, as land constraints often become binding consecutively. Moreover and contrary to previous research, distance from towns is not a major predictor of agricultural market access and thus participation in these countries. It is hypthesized that this comes partly through mobile phone technology which makes traders nowadays more likely to travel to remote regions. This relates to Chamberlin and Jayne (2013) who show that indicators of market access are rarely correlated over time in Kenya, and that distance measures to physical infrastructure are often not representative of market access for farmers, as this rather depends on the behavior of market agents.

While the studies above were largely concerned with rural markets, research has also looked at

[3]The 2008 World Development Report estimates that at least 80% of African rural poverty reduction between 1993 and 2007 is caused by household strategies (World Bank, 2008, p. 48) other than migration.

linkages to large urban markets. Cali and Menon (2013) use panel data on the Indian district level to disentangle through which channels urbanization affects surrounding rural areas. They find that urbanization creates significant spillovers for the surrounding rural areas, mostly in the form of increased demand for agricultural products. However, the authors assume no inter-district trade of agricultural commodities and do not account for urbanization in neighboring districts, letting the validity of the results seem questionable. Vandercasteelen et al. (2016) analyze a panel of teff farmers around Addis Ababa. They find that proximity to the city and a decrease in transport costs lead to investments in productivity and an overall intensification. The authors do not control for unobserved household heterogeneity though and are silent on poverty effects. Relatedly, Neven et al. (2009) analyze the impact of local supermarket procurement on small and medium farmers in the vicinity of Nairobi. They find that there exists a set of preconditions in terms of physical, human and organizational capital predetermining participation in the procurement channels. Furthermore, supply is mostly produced by emerging medium-sized farmers who strongly intensify production and employ sizable numbers of hired and above-average paid labor. The authors liken the effect of urban demand to that of export demand which partly spurred the Green Revolution in Asia.

The studies cited above thus confirm the first result of an earlier broad literature review by Barrett (2008), who finds that the first of two barriers to market participation is the ownership of productive assets which allow households to produce a marketable surplus in the first place. Secondly, infrastructure such as roads and markets, as well as technology provided by the government were found to be key determinants of participation, possibly because African agricultural markets are characterized by relatively weak hierarchies, i.e. consist of many small aggregators and retailers, decreasing margins and possibly also price transmission to farmers (Fafchamps, 2004, p. 12). Indeed, it is found that the spread between farm-gate and retail price is particularly large in Africa. At the same time though, it is argued that increased market participation would allow farmers to tap into growing markets, produce according to their competitive advantage (Barrett, 2008) and reduce overall price volatility. The latter and associated insecurity for market participants are found to be key features of African staple markets (Chapoto and Jayne, 2009), especially in more remote areas (Moctar et al., 2015).

Numerous empirical studies have set out to quantify the importance of market access and rural-urban linkages for poverty reduction through analyzing road or railway extension projects. General findings from cross-country and macro-level analysis are that income opportunities are diversified as the local economy improves (see e.g. Ali et al., 2015; Iimi et al., 2015) and within-country price differentials decrease (see e.g. Donaldson, 2010; Minten and Kyle, 1999) as infrastructure is extended. A different approach is taken by Jacoby and Minten (2009) who estimate farmers' willingness-to-pay for improved transportation in a remote Malagasy region through specifying a general equilibrium model taking into account the actual distribution of transport costs. A simulated decrease in transport cost of the most remote village to that of the best connected one then increases household income by 52%. Two thirds of this effect reflect improved access to non-farm income opportunities in nearby towns, while one third stems from decreased costs of transport for in- and outputs. A similar result is found by Qin and Zhang (2016) who show that the poorest households in a sample of Chinese villages profited from road extensions mainly through non-farm employment opportunities. Another study from de Weerdt (2010) uses a subset of the Kagera-data described above to show that agricultural diversification away from the traditional crops of bananas and coffee, as well as engaging in non-farm activities such as small-scale trade help people leave poverty. On the other hand, he argues that initial conditions like connectedness, human capital and land endowments are decisive, and that initial disadvantages are exacerbated by remoteness. As a policy conclusion, he suggests that not only diversification in itself, but also the right initial conditions such as human capital and exposure to market opportunities (through e.g. communication technologies) should be in place. Michler and Josephson (2017) relatedly find that crop diversification in Ethiopia is associated with decreases in the likelihood of being poor for both initially poor and non-poor households. The authors do not clarify though whether diversification serves to stabilize self-consumption on the farm or market income from selling a broader range of crops.

It can thus be concluded that there appear to be significant gains from participating in newly opening agricultural markets, partly through non-farm opportunities. However, there is a lack of evidence as to whether demand from urban areas can also drive the profitability of AMP.

2.1.2 The rural non-farm economy - surplus labor outlet or growth engine?

As already became apparent in the previous section, the rural non-farm economy (RNFE) is a crucial instrument to provide increasing rural populations, and particularly landless households, with gainful income opportunities (World Bank, 2009). While the sector is initially closely linked with agriculture, external demand through better connectivity and urbanization can lead to it becoming detached from agriculture and a less seasonal and more gainful income source (World Bank, 2008).[4] Besides wage employment, NAHEs in sectors such as small-scale manufacturing (including food processing), utility

[4] At the same time though, better connectivity may mean that the RNFE is less protected from outside competition. Aggregate effects then depend on the composition of the RNFE (Hazell et al., 2007).

supply and trading can be seen as a subset of the RNFE.

An instructive recent overview of NAHE activities in Africa is given by Nagler and Naudé (2017) who descriptively analyze cross-sectional data for six countries (Ethiopia, Malawi, Niger, Nigeria, Tanzania, Uganda) from the same surveys this study is using. It finds that 42% of households entertain a NAHE contributing between 8.5% (Malawi) and 36% (Niger) to household income. Households enter NAHE activities both as a result of push factors (as measured by recent experiences of food insecurity) and pull factors (opportunities through proximity to towns), although the picture is not consistent across countries. The productivity of Ugandan NAHEs is found to monotonously decline with distance from population centers. The authors do not provide evidence on the poverty impacts of NAHEs.

It has been argued earlier by Lanjouw (2007) that these impacts have not been convincingly studied in the past, leading him to propose three determinants of how well the non-farm economy works to raise people from poverty. Firstly, the question is whether the poor have equal access to it (in terms of required qualifications, but also assets, personal attributes) than do the less poor. A general finding seems to be that this has not been the case in the 1990s and 2000s. Secondly, it has to be assessed how well the non-farm economy serves as a safety net for those being pushed out of their previous economic activity, e.g. from agriculture through a drought. Finally, there may be important spillovers from the non-farm economy to other sectors where the poor are more represented, e.g. in agriculture. Lanjouw argues though that this is less likely in the African context where self-employment is more common than salaried employment, meaning that the effect of rising wages in case of increased economic activity is less relevant. An application of this framework comes from Bezu et al. (2012) who use an Ethiopian panel to assess the poverty outcomes of engaging in the RNFE, which explicitly includes wage employment, but is dominated by NAHEs. They find that while initial RNFE participation appears to originate more in desperation than opportunity-seeking for poor households, their consumption growth after increasing reliance on the RNFE is similar to wealthy households. The authors thus argue that the RNFE can offer improved prospects for all participating households, yet do not control for longer-term effects. It is shown by Fox and Sohnesen (2016) that NAHEs generate more employment in the rural areas of eight African countries than formal wage jobs, and that they, controlling for location and human capital, have the same marginal payoff in terms of consumption as private wage and salary employment. A more detailed analysis of Mozambican data finds that welfare payoffs are particularly large for *rural* NAHEs. Relatedly, Dorosh and Thurlow (2016) through economy-wide analysis of five African economies (Malawi, Mozambique, Tanzania, Uganda, Zambia) find that some subsectors of the non-agricultural economy have poverty-growth elasticities close to the high ones estimated for smallholder agriculture. In particular, household-based, small-scale food processing and transport services seem to gainfully employ large segments of the poor population. However, these studies are silent on the economic geography of the activities studied.

In the light of observed high returns to running a NAHE in Africa, an obvious issue are then the constraints faced by the sector. Lack of demand and localized sales are identified as major challenges in Asian countries, but also in Tanzania, where more than 70% of NAHEs sell locally (World Bank, 2008, ch. 9). The report further argues that, since NAHEs are closely related to the agricultural sector, the constraints holding the sectors back are the same. Positive developments in one sector should thus also positively affect the other. Indeed, Haggblade et al. (2010) stress the importance of access to markets and buoyant rural economies that NAHEs can tap into. At the same time, employment in agro-processing still appears relatively limited, implying that there would be potential for increased forward linkages from the agricultural sector. The report suggests a focus on the investment climate for NAHEs, and in particular in areas with high population densities where infrastructure needs are concentrated (World Bank, 2008, ch. 9). This reflects the view by Wiggins and Hazell (2011) who underline that for the RNFE to be buoyant and not only a result of push factors, urban demand or at least money injected through migration are key. This is supported by Renkow (2007) who theoretically and empirically assesses the distribution of RNFE in the vicinity of cities and towns. He concludes that theoretical predictions based on the von-Thünen and new-economic-geography models are confirmed, as the density, productivity and employment effects of the RNFE generally decrease with distance from an urban center. He admits though that econometric evidence is sparse and does not translate the findings on engagement in the RNFE to poverty impacts. Subsequent micro-studies by Deichmann et al. (2008) for Bangladesh and Arouri et al. (2017) for Vietnam dissect the geographic space and find that rural areas close to urban agglomerations can benefit from increased market opportunities, especially for non-agricultural goods and services. However, it is generally observed that linkages between urban and rural areas are weaker in Africa than in Asia, due to lower levels of non-food consumption and less developed transport infrastructure in the former (Renkow, 2007).

The above constraints are also reflected in an observed high rate of business closures. Liedholm (2007) argues that NAHEs in Africa contribute to employment generation mainly through starting new enterprises, as opposed to the expansion of existing ones. Growth in the RNFE would therefore not necessarily most effectively be supported by providing cash assistance to start-ups, but rather through opening up markets for existing ventures. Relatedly, Rijkers and Söderbom (2013) show that NAHE creation in Ethiopia is closely and positively related to rainfall shocks affecting the agricultural sector. The authors argue that NAHEs can be seen as reaping the benefits from existing market opportunities, while also providing a safety net for marginalized groups that might otherwise go unemployed.

Two takeaways emerge from this literature review: Firstly, NAHEs appear to provide payoffs in terms of poverty reduction and can buffer income shocks. Secondly, proximity to urban areas is often argued to play an important role in determining the payoffs, though this has not been empirically studied in the African context.

3 Conceptual framework and contribution

3.1 The role of urban areas for the rural economy

The urban-rural dichotomy continues to feature heavily in the economic and policy discourse, thereby often assuming an implausible homogeneity of rural areas. However, more recent work has looked at non-urban areas in more detail, forming the conceptual base for the present study. Gollin and Rogerson (2014) develop a general equilibrium multi-sector model with an urban, a well-connected rural and a remote rural region. They show that subsistence agriculture in the remote region is a consequence of transport costs, while the well-connected region becomes increasingly integrated with the urban region as transport costs decrease and urban population grows. According to this view, households in more remote regions would not rationally participate in agricultural markets as there is no sufficient demand promising higher consumption levels than home consumption does. Better connected households would on the other hand be able to reap the benefits of higher and more stable prices for agricultural goods in the vicinity of cities whose populations depend on the market for their consumption. The model does not explicitly allow for non-agricultural sectors in the rural areas, and is thus silent on the effects of integration of service and manufacturing markets. Given the strong interconnectedness of the rural farm and non-farm economies however, it appears likely that buoyant agricultural sectors would also support non-farm ventures, aside from the enterprises' own ability to tap into urban demand for small-scale manufactured goods and basic services.

Structural transformation in the economic structure described above is then a function of remoteness, and is not expected in ill-connected regions where subsistence agriculture persists. This view mirrors the conditions stated by Collier and Dercon (2014) and presented above, in particular a shift of economic activity and population towards centers of economic activity, such as cities.

An important question is then obviously what characterizes the urban centers that are able to generate the described demand pull to the surrounding areas. While the Gollin-Rogerson-model does not provide a clear answer to this, three categories of urban areas would seem conceivable and potentially useful in the following analysis. On the one extreme, primary cities are in most African countries the hub of production and extend the largest demand pulls to the surrounding areas. On the other end of the spectrum, myriad rural towns have important supply and intermediary functions to their surroundings. It seems doubtful though whether the relatively small populations there reflect the demand pull described in the model. However, urbanization is not only taking place in the primary cities, but also in large towns across the continent. For a geographic analysis of demand effects, it can thus be argued that these large towns in between the two extreme categories present the most natural reference points. The focus of the following econometric analysis will therefore be on distance to large towns (further defined below). As a robustness check, the analysis will also be carried out with distance to market towns and the primary city.

3.2 Contributions of the analysis

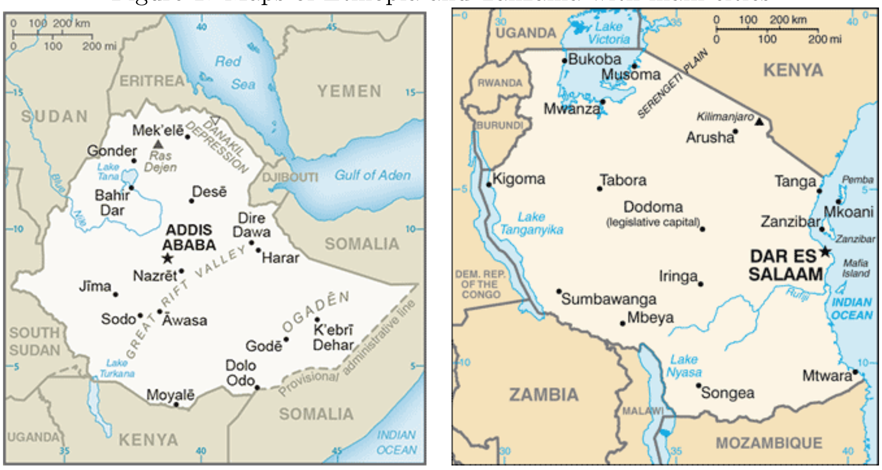
While being an instructive depiction of linkages, the model by Gollin and Rogerson (2014) has so far not been tested econometrically, nor have Collier and Dercon (2014) underpinned their reasoning by empirical analysis. One implication of their studies would be that households in less-remote areas can benefit from market participation, while those in remote areas would not rationally participate in the market, and thus remain in subsistence as demand is too low. Relatedly, Nagler and Naudé (2017) show that NAHEs can be both a feature of buoyant rural economies (if the result of demand shocks), and of the most stagnant ones (if households use them as a coping mechanism to adverse shocks). The present study seeks to disentangle these effects while also attempting to identify the line between less and more remote regions in Ethiopia and Tanzania. Furthermore, it will shed light on two of the channels hypothesized to lead to better health outcomes in less remote areas ('Non-farm employment'; 'Incomes') by Darrouzet-Nardi and Masters (2015).

Through this, the thesis contributes to two distinct strands of the economic literature. It informs the debate on the rural non-farm economy by providing econometric evidence on the relative benefits of engaging in it depending on remoteness from economic centers. Previous research has often not linked engagement in the RNFE to poverty outcomes, or failed to consider the economic geography of the countries studied. Secondly, it adds to the discussion on the commercialization of smallholder farming. It explicitly acknowledges that not only market efficiency arguments have to be considered, but also that the opportunities offered to the farmer by AMP are crucial in assessing the desirability of commercialization. In addition, the study provides a deeper insight into whether urbanization could be a driver of increased market opportunities. Finally, this study is to the best of my knowledge the first exploiting the extensive LSMS-ISA panel data to shed light on transformation processes.

4 Country backgrounds

The two countries explicitly studied here are Ethiopia and mainland Tanzania. It was decided to focus on the mainland because the measures of remoteness used are not easily extended to islands. The two countries have recently experienced relatively fast growth in urban populations, maintain however a high share of rural population (Table 1). Poverty continues to be widespread in both countries, as well as employment in agriculture. They therefore present interesting cases for this thesis. The following subsections will discuss economic features that are relevant for the following analysis.

Figure 1: Maps of Ethiopia and Tanzania with main cities



Source: CIA World Factbook

4.1 Poverty trends and structural transformation

Both countries have generally been examples of slow structural transformation. In the first decade of this century however, agricultural productivity has risen relatively fast in Ethiopia, while manufacturing productivity was the lowest and contracted the most among the sample of relatively more industrialized African countries studied in Enache et al. (2016). More recently though, increased investments in manufacturing and infrastructure make an accelerated transformation seem likely (Dorosh and Schmidt, 2010). Tanzanian agriculture was more productive than the Ethiopian one in the first decade of the 2000s but transformed at a much slower rate. Productivity of the wholesale and retail trade sector remained stagnant in both countries, while it was found to be a driver of transformation towards a non-agricultural economy in Africa as a whole (Enache et al., 2016).

Despite urban areas housing large numbers of poor people, poverty predominantly remains a rural phenomenon in both countries. The most recent estimates put rural poverty at 33% (World Bank, 2015c, ch. 4), while the rate stood at 4% and 22% in Dar es Salaam and other urban areas, respectively. It was found that the largest decrease occurred in Dar es Salaam and rural areas yet poverty remained more or less constant in other urban areas. For Ethiopia, it is found that poverty in 2011 was both an urban and a rural phenomenon, with the headcount ratio according to the national cutoff standing at 28% in Addis Ababa (33% in 2005), 26% in all urban areas (35% in 2005) and 30.4% in rural Ethiopia (39.3% in 2005) (World Bank, 2015a). Remoteness is a key predictor of chronic poverty however in a 15-year longitudinal data set for Ethiopia (Dercon et al., 2012). It can be said then that poverty trends in both countries share similarities, as levels are coming down, and that this is observed in both urban and rural areas. However, the differences in levels between the two primary cities are striking, keeping in mind usual data quality and comparability caveats.

Importantly for this study, Ethiopia was and is still seeing large investments in road infrastructure, leading to a widespread upgrading of existing and construction of new roads. The program has been shown to drive structural changes in the manufacturing sector (Shiferaw et al., 2015) and to promote growth in the overall economy (Moller and Wacker, 2017), while assessments of the impact on rural areas are absent so far.

Table 1: Country characteristics Ethiopia and Tanzania

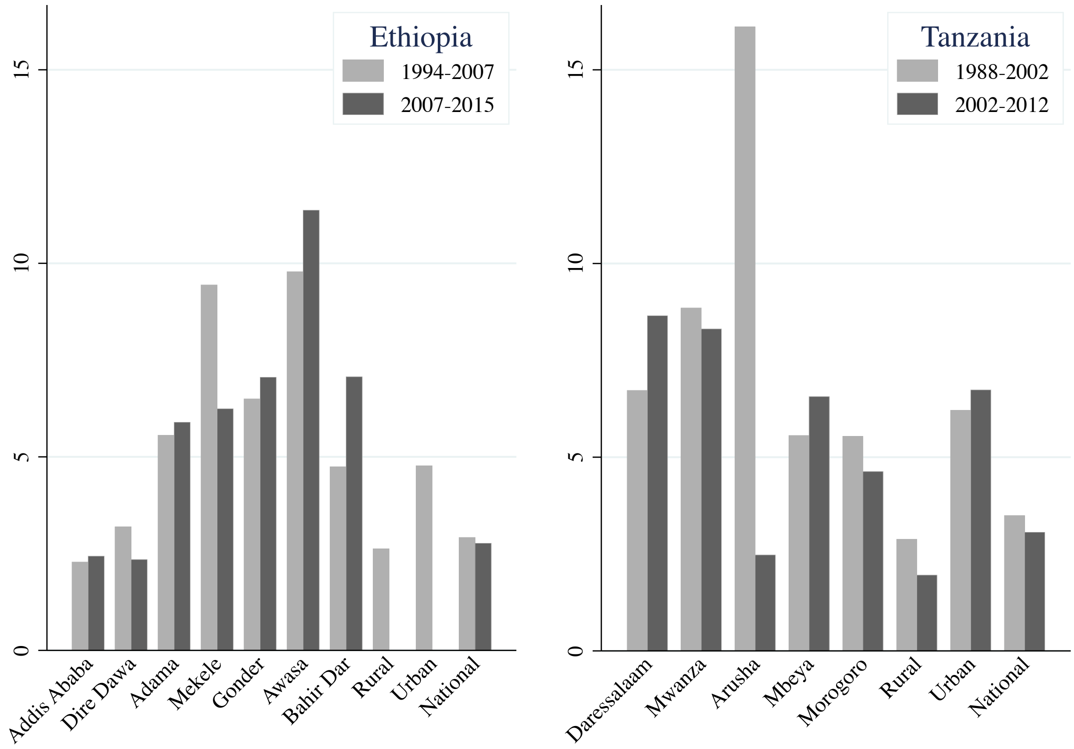
	Ethiopia	Tanzania
Total population (mio)	99.4	53.5
Urban population (% of total)	19.5	31.6
Population density ($people/km^2$)	99.4	60.4
Population in largest city (% of total)	3.3	9.6
Poverty rate (% of total below 1.90$, 2011 PPP)	33.5 (2010)	46.6 (2011)
Employment in agriculture (% of total)	72.7 (2013)	66.9 (2014)
Agricultural exports (% of GDP)	5.6	6.3

Note: Unless otherwise stated, data is from 2015. Source: World Development Indicators (accessed Mar 30, 2017)

4.2 Urbanization trends

While it is difficult to obtain accurate and comparative population statistics, the evidence presented in Figure 2 suggests that urbanization in Ethiopia has been driven by the large cities, though not primarily Addis Ababa. It is projected that Ethiopia will experience a tripling of its urban population between 2015 and 2034, bringing with it an accelerated economic transformation (World Bank et al., 2015). In Tanzania, urban areas appear to have grown faster than the national average as well. However, here this is driven by the largest cities.

Figure 2: Annual urban population growth rates Ethiopia and Tanzania



Note: Cities sorted by size according to latest census. Data for Ethiopia in 2015 are projected figures by MUDHCo and ECSU (2015). Source: Census data collected by citypopulation.de, augmented with data from census documents

4.3 Agricultural markets and land tenure

As outlined in the conceptual framework, food prices are a key transmission mechanism of increased demand from urban to rural areas. It will therefore be important to assess whether, given the prevalent agricultural market structure, such a transmission is likely to occur. Chapoto and Jayne (2009) characterize Tanzania and Ethiopia as countries where agricultural market liberalization has only been partial and governmental agencies continue to play a large role through policies like marketing boards and trade bans. These are found to explain much of the price variation in Eastern and Southern African countries, and thus likely also hamper price transmission across the country. In Ethiopia, the grain market was deregulated in 1990, after which the state marketing board reduced its activities and private trade was allowed (Gabre-Madhin, 2001). It has been found in a case study by Getnet (2008) that price signals from the central grain wholesale market in Addis Ababa transmit to the studied retail market 120km away in the years 1996-2000, yet prices remain unpredictable overall as their time series contains a unit root. The study also finds that the analyzed grain market is reasonably competitive and diverse. In a similar analysis, Vandercasteelen et al. (2016) find that farmers in the vicinity of Addis Ababa react stronger to price signals and increase productivity to tap into urban demand. A more extensive, but slightly dated study by Gabre-Madhin (2001) argues that grain traders seek arbitrage over a distance of, on average, 200km and that grain market deregulation had at the time not led to fully integrated markets across the country.[5]

In Tanzania, agricultural markets were liberalized around 1985. A recently re-published study by Cooksey (2011) from the early 2000s argues that liberalization advanced most for domestically traded crops, while export crops like coffee and tobacco have seen a return of the state. Interestingly, IFPRI (2000, p. 53) finds that the abolition of country-wide uniform prices for maize led to a shift in production towards Dar es Salaam, away from the traditional growing regions in the south-west. This is mirrored in results by Kilima et al. (2008) who argue that post-liberalization maize prices became more volatile, yet this is mitigated by proximity to more developed regions and cities.

Land ownership systems are a related aspect, which will be discussed here shortly given that the construction of key variables below relies on cultivated land. Following nationalization of all land in Ethiopia under the Derg in 1974, the post-revolutionary system maintained the prohibition of private land property (Ambaye, 2013, Ch. 2). Analysis of the LSMS-ISA data suggests that granting of land by local leaders (40% of plots in 2011/12), inheriting (34.7%) and renting (12.4%) are the most common forms of accessing land, with the average length of holding a particular plot appearing high at 20 years. Cooperative membership is prevalent (36% of households with at least one member in a

[5] Analysis of the LSMS-ISA data used below reveals that farmers in less remote areas have seen improvements in access to buyers (not necessarily markets) over the last years: the mean distance to large towns of villages where a village council reported an improvement in the access to buyers over the last 5 years stood at 210km in 2015, whereas no change and decrease in access were stated in the more remote areas (229km and 285km, respectively).

cooperative), yet only 14% of households report selling more than half of their harvest through the cooperative (Minot and Mekonnen, 2012). In Tanzania, land is predominantly allotted to households (often under customary rights (United Republic of Tanzania, 1999); 83% of plots in 2008, LSMS-ISA data) or village land 'used free of charge' (11%), with an average duration of tenancy of 24 years.

It can be concluded that in both countries customary or collective tenure is common, yet farmers largely enjoy discretion over whether to sell or keep their produce. Furthermore, liberalization of agricultural markets has at least partially taken place in both countries and there is evidence of arbitrage and private trade linking surplus and deficit areas.

5 Econometric analysis

After presenting the sample and the distance measure, the following sections discuss the econometric specification and the variables employed.

5.1 Sample

The study uses data provided by the LSMS-ISA project under the direction of the World Bank.[6] It contains geo-coded household panel data over three waves in each of the countries (2011/12, 2013/14, 2015/16 in Ethiopia; 2008/09, 2010/11, 2012/13 in Tanzania). The overall attrition rates are low (4.8% in Tanzania (NBS, 2014); 5% in Ethiopia (CSA & LSMS, 2017)). Rural households that are observed in at least two periods and do not depend on formal employment for the majority of their income are included in the main study.[7] The latter lets households working more than five hours per day and adult in formal employment (Ethiopia) and those stating formal employment as their only or primary *and* secondary income source (Tanzania) be excluded, as such households with e.g. public employees are not the focus of this study. In Section 7.2, it will be shown how this exclusion affects the results.

5.2 Measures of distance

The central contribution of the analysis will be to look at heterogeneities within rural areas. It is therefore necessary to develop a measure of remoteness that goes beyond a simple urban-rural

[6] The project's aim is to design and implement, in cooperation with the statistical offices of eight African countries, 'systems of multi-topic, nationally representative panel household surveys with a strong focus on agriculture' (World Bank, 2015b).

[7] Even though the Tanzanian survey includes a tracking component, I focus on households staying within the same community for at least two periods, since I do not have information on a household's new location from the years before it moved there. Therefore, my study will only cover the non-migrating population. Given that its focus is on strategies of households in *rural* areas, excluding migrants will not affect the interpretability of results.

distinction. Primarily, the kilometer distance to 'large towns' will be used, while distance to Addis Ababa / Dar es Salaam and distance to the next market town will be explored as robustness checks. The latter is given in the survey (distance to the next weekly market), and the former two have to be imputed from the information given: The surveys include a question on the kilometer road distance to the district capital (Tanzania)[8] or the next 'urban center' (Ethiopia).[9] These are then added to the kilometer road distance from the district capitals / urban centers to the identified large towns or the primary city using Google Maps. While taking the distance via the stated town might overestimate the actual distance in case of a particular village lying on the road between the district capitals / urban centers and the large town, it still is a valid measure of distance to the closest market, as these places are also likely to be transport nodes.

A decisive question is then the definition of a 'large town'. While relatively recent census data is available (2007 in Ethiopia, 2012 in Tanzania), it has been argued that definitions of urban areas between countries differ greatly (Satterthwaite, 2010), making comparisons difficult and the absolute numbers unreliable for exact cutoffs. The definition of a large town is therefore based on its relative primacy in the size-distribution of urban areas in a given country. Figure 3 shows the size distribution of cities in both countries. Based on visual inspection, the ten (Ethiopia) and five (Tanzania) biggest cities are defined as large towns. This is based on them not falling into the more continuous distribution of cities of smaller sizes, and thus having a large degree of primacy in the distribution of urban places. The robustness checks in Section 7.1 will explore the validity of this choice. Figure 4 shows the distance of every survey enumeration area to the chosen large towns. It is worth noting at this stage that the distance to major cities in neighboring countries is not considered. This is partly because inter-African trade levels are generally low and because households are almost always closer to large cities within Ethiopia and Tanzania than to possibly included urban centers in neighboring countries.[10]

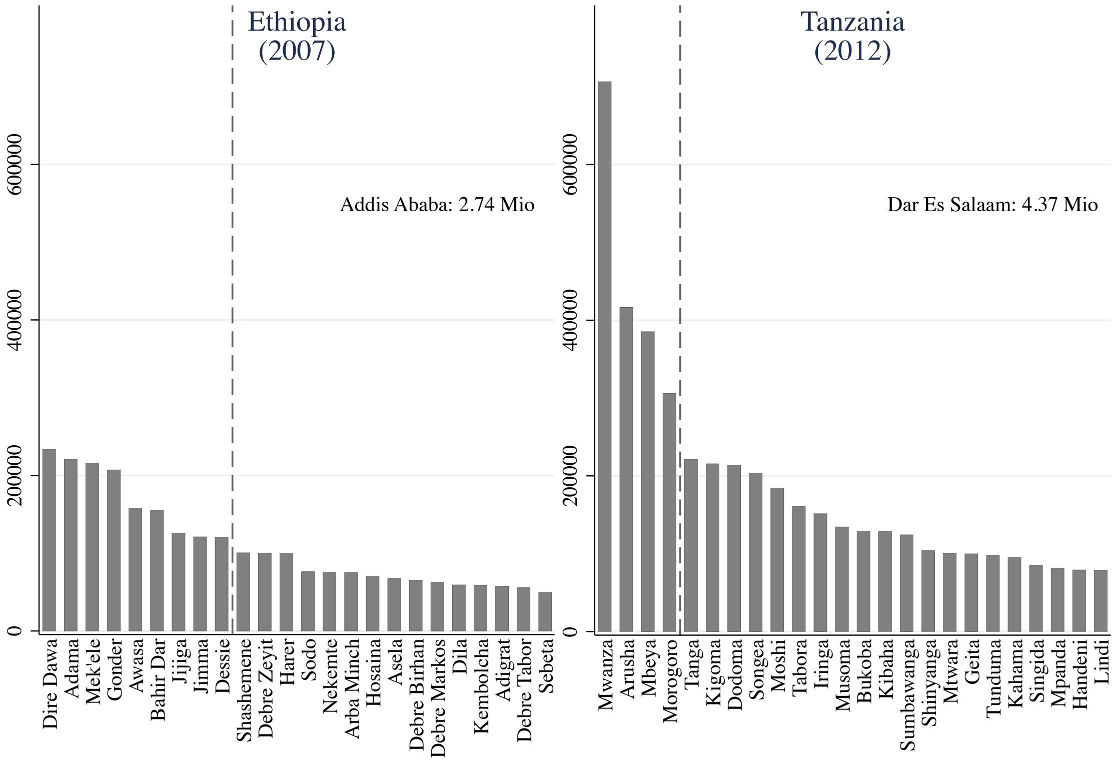
In the regressions below, interaction terms with dummies are used, assigning observations to distance groups with an interval breadth of 50km. For example, the first group consists of all households within 50km of a large town, the second group of all further than 50km but less than 100km away, and so on. All households located further away than 600km are treated together in the last group. In

[8]Districts are lower levels of administration and number 169.

[9]Since these information are collected in interviews with a panel of village representatives, there is no definition of what defines an urban center. The survey also states the reference point taken by the village elders. In some cases, this coincides with the definition of 'large towns' taken in the study, in others it refers to (according to Google Earth) small towns. It has been found that over the three survey rounds, stated distances sometimes differ slightly and I therefore take the average of the available distances.

[10]In Tanzania: Arusha on the border to Kenya, Mwanza in the Lake Victoria Region and Mbeya on the road to Malawi and Zambia. In Ethiopia, merchandise (including agricultural) exports to other countries in Africa only constitute 1.8% of all merchandise exports, reflecting the political tensions along many of its borders.

Figure 3: City size distribution as per latest census and applied cutoff



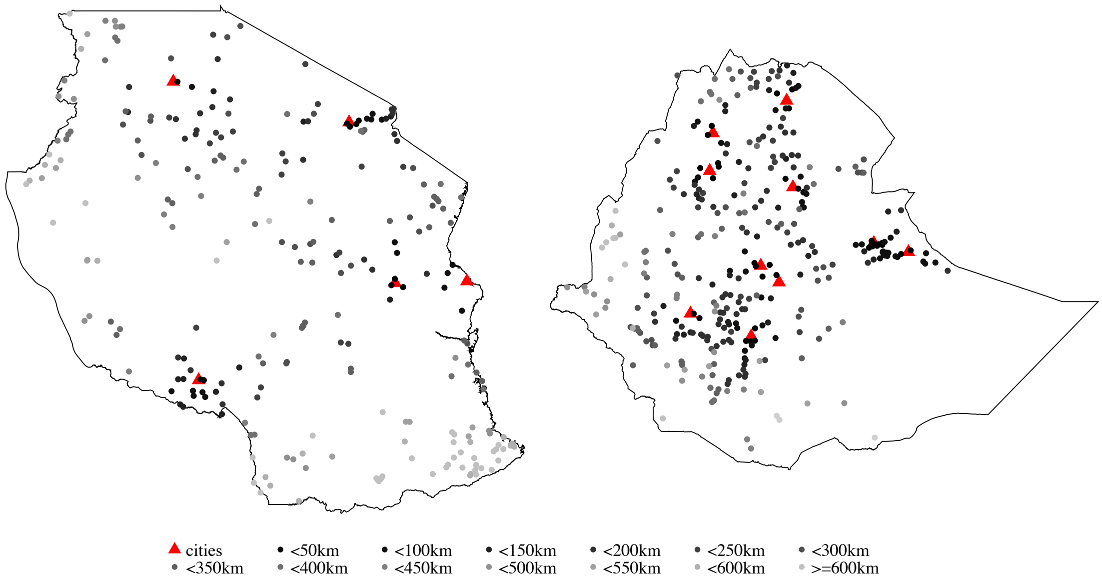
Source: Author's rendition of census-based data provided by citypopulation.de (2017).

choosing the breadth of the interval, a balance had to be struck between capturing geographical effects and maintaining a meaningful sample size. Table 2 shows the resulting split of the sample. As not all households in the sample are engaged in agriculture, the sample size is reduced for the AMP analysis.

Table 2: Observations per distance ring
All households (left) and cultivators only (right)

Distance	Ethiopia						Tanzania					
(km)	2011		2013		2015		2008		2010		2012	
≤ 50	353	244	358	283	343	219	83	48	78	51	79	42
≤ 100	504	359	505	396	464	270	140	111	131	99	130	92
≤ 150	343	217	329	240	317	192	115	103	112	100	105	91
≤ 200	670	466	660	519	622	389	199	151	190	142	192	142
≤ 250	312	197	300	220	286	169	134	86	128	87	128	99
≤ 300	348	188	351	228	322	169	170	130	166	130	159	124
≤ 350	311	211	303	246	277	190	290	228	274	214	273	208
≤ 400	172	104	170	136	155	108	160	119	154	120	160	125
≤ 450	167	107	161	116	147	88	96	81	95	76	91	72
≤ 500	92	63	93	73	79	45	99	90	97	85	96	81
≤ 550	93	65	100	78	82	55	75	58	76	57	72	54
≤ 600	33	28	34	25	32	19	131	98	128	106	132	105
> 600	174	103	171	104	161	79	290	246	289	238	282	238
by year	3572	2352	3535	2664	3287	1992	1982	1549	1907	1505	1899	1476
Total			10394 (7008)						5788 (4530)			

Figure 4: Map of households' distance to closest large town



Note: Maps not drawn to scale of each other.

5.3 Model

The analysis will proceed as follows: First, it is examined whether AMP and NAHE have payoffs in terms of consumption components (food and non-food consumption; see Section 5.4). Thereafter, a set of regressions establishes whether a relation between urban proximity and adoption of the two strategies exists. The main contribution of the thesis follows as a third step, where payoffs are related to distance from the closest large town. This is estimated for both contemporary and lagged changes in the dependent variables to address concerns of reverse causality and explore longer-term effects. Section 7 then explores whether patterns are robust to various further examinations.

The first specification to be estimated is the following:

$$Cons_{itjk} = \beta_0 + \beta_1 IND_{it} + \beta_2 X_i^1 + \beta_3 X_{it}^2 + \beta_4 Z_{jt} + \beta_5 V_{kt} + \beta_6 W_t + \varepsilon_{it} \tag{1}$$

where

- $Cons_{itjk}$ is the consumption component of household i at time t in village/community j in region k (see Section 5.4),
- IND_{it} is the indicator for participation in either NAHE or AMP (see Section 5.5),

- X_i^1 is the household-fixed effect capturing time-invariant characteristics that are likely to affect consumption and strategy choice, such as education of adults, ability, location, agro-ecological conditions,
- X_{it}^2 is a vector of time-varying household characteristics, such as number of adults in the household, health status of members or receipts of transfer incomes (see Section 5.6),
- Z_{jt} is a vector of time-varying village characteristics, such as rainfall adequacy or price trends (see Section 5.6),
- V_{kt} is a vector of region (Ethiopia) / zone (Tanzania) fixed effects in a given year, thus also capturing rainfall adequacy and political developments (see Section 5.6),
- W_t is a vector of year dummies, capturing country-wide year-specific effects.

Standard errors are clustered at the village/community level, following Deaton (1997, ch 2.2).[11] Given the panel structure of the data, unobservable factors could also be controlled for through first-differencing. The analysis will rely on fixed effects however as the approach is more efficient in an unbalanced panel with missing observations for some years. The main coefficient of interest will be β_1, indicating the returns to engaging in AMP and NAHE for a given household. Note that given the employed household-fixed effects, the coefficient only measures changes in the indicator over the survey period, i.e. it does not capture potentially different trends for households whose engagement in a certain strategy is constant over the study period. Based on previous research outlined in Section 2.1, it is expected to be positive, leading to hypothesis H1:

> β_1 *in Regression (1) is positive for AMP and NAHE in both countries, indicating positive returns to engaging in the strategies.*

The second step of the analysis will be to explore whether choosing the strategies depends on a households' location. Should this be the case, then the choice of strategies across space is likely to be the result of differential propensities of households to engage in them in the first place, rather than reflecting underlying economic dynamics. The following regression is therefore run for both strategies,

$$IND_{ijtk} = \beta_0 + \beta_1 distcat_j + \beta_2 X_{it} + \beta_3 Z_{jt} + \beta_4 V_{kt}^1 + \beta_5 V_k^2 + \beta_6 W_t + \varepsilon_{it} \tag{2}$$

[11] It was decided to perform unweighted regressions, despite the dataset offering weights for sampling probabilities. This follows the argument made by (Deaton, 1997, ch. 2.) that weighted regression is only useful when it assumed that behavior between the stratae (for Ethiopia the Amhara, Oromiya, SNNP, Tigray and all other regions combined) differs structurally.

where $distcat_j$ is a vector of dummies assigning household i in village j to the groups presented in Table 2. The β_1 will then present the likelihood of engaging in a particular channel at a given distance, relative to the reference category of households more than 600km away from the closest large town. Since distance to large towns is constant across towns, no household-fixed effects can be controlled for. Therefore, a slightly richer set of variables is used in X_{it} by adding average years of education of the household, and employ a region-fixed effect V_k to capture, among others, agro-ecological constants. Z_{jt}, V_{kt} and W_t are unchanged. Based on the conceptual framework, in Section 3.1, the following hypothesis H2 is stated:

> *The β_1 in Regression (2) decrease with distance from large towns, as only the less remote households can rationally benefit from NAHE and AMP.*

The third and central set of regressions then establishes whether there exists a spatial pattern of payoffs. To this end, Regression (1) is slightly altered in that IND_{it} is interacted with dummies identifying the distance rings described above,

$$Cons_{itjk} = \beta_0 + \beta_1(IND_{it} \times distcat_j) + \beta_2 X_i^1 + \beta_3 X_{it}^2 + \beta_4 Z_{jt} + \beta_5 V_{kt} + \beta_6 W_t + \varepsilon_{it} \qquad (3)$$

where $distcat_j$ is defined as in Regression (2). β_1 is then a vector of estimates for the average effect of adopting a given strategy in a particular distance ring, i.e. for all households in areas less than $x\,km$, but more than $x - 50\,km$ away from the next large town. Based on the discussion in Section 3.1, the following hypothesis H3 is derived:

> *The β_1 in Regression (3) are largest in areas relatively closer to large towns for both AMP and NAHE.*

The following subsections present the construction and discuss the validity of the dependent, main explanatory and control variables.

5.4 Dependent variables - measures of consumption

In the analysis below, the poverty measure of consumption is broken up into food and non-food to be used as the dependent variables. While poverty rates are usually calculated based on their sum, both components are interesting in their own right: Food consumption (measured per adult equivalent of the household) directly relates to household food security and health outcomes, but its measurement is heavily price affected and thus not easily compared over time. Non-food consumption reflects needs of the household besides subsistence, and its share of total consumption will rise as development proceeds. These variables are provided through the datasets and are logged to ease interpretability. Detailed procedures of their construction are given in the accompanying documentation (e.g. ECSA, 2013; TNBoS, 2011).[12]

Adult equivalents are based on the food consumption needs of individuals at a given age[13] and annual food consumption is estimated based on the stated consumption over the previous seven days which is then scaled up over the whole year. This may be problematic as consumption has been shown to be affected by agricultural seasons (Deaton, 1997, p. 25), a concern that will be addressed in the regression setup below. Using the nominal values is less of a concern here, as the main interest lies in percentage changes of consumption, where a general trend of overall inflation or regional price differences is controlled for by the fixed-effect design.

The non-food component is comprised slightly differently between the two countries: In Ethiopia, it consists of household expenditure on consumer goods like soap, pots and clothes, as well as education expenditure. In Tanzania, it includes expenditure on utilities like water and kerosene, consumer goods, education and communication. As a robustness check, it will also be explored whether hours worked after entry into NAHE differ across space, as a not price-affected indication of NAHE profitability.

5.5 Main explanatory variables - household strategies

Each of the two strategies identified above is measured through a specific indicator. Firstly, AMP is constructed as the share of cultivated land per farm household that is devoted to market production. For this, information on the crop grown per plot, the size of the plot,[14] and the share of marketed produce was combined. It was decided to focus on devoted land instead of actual output sold (the measure suggested by von Braun et al. (1994) and often used in case studies for particular crops), as multiple units of measurement for different crops do not allow for a clear-cut comparison of, say, flowers and maize. The analysis furthermore does not differentiate between cash and staple crops, as households are often found to sell significant proportions of their staple food production to the market (see e.g. Jayne et al. (2010) who find that around 15% of Malawian farmers consistently

[12] It is worth noting that the variables are winsorized at the 97th (2011, Ethiopia) or 99th (2015, Ethiopia) percentile to account for probably faulty outliers.

[13] For example in Ethiopia, a male aged between 30 and 60 is counted as 100%, a female of the same age with 82%, males between 16 and 18 with 114% (female 86%) and males and females below one year with 33%. The Tanzanian scale is slightly different and less fine-grained but conceptually very similar.

[14] Both surveys measured parts of the available fields per GPS(84% in Ethiopia, 17% in Tanzania). If this presumably most accurate measurement was not available, figures from rope measurements (Ethiopia) or estimates from the farmer (Tanzania) were used.

sell at least parts of their maize crop). An important abstraction here is the exclusion of livestock production as there is no intuitive way of combining crop and meat production into a single indicator. Despite the undeniable importance of the livestock sector, especially in Ethiopia, this exclusion does not reduce the validity of the indicator for AMP. While crop production is by far more common in both countries,[15] livestock production can be assumed to be more market-oriented than crop production, and the indicator thus serves as a lower bound of market participation. Any effects found would thus likely be present in a similar or even stronger way when including pastoralists.

The indicator for NAHEs differs between the two countries because of different data availability. A simple dummy measures whether any member of the household runs a NAHE in Tanzania. For Ethiopia, a richer indicator is used, namely the share of household income derived from NAHEs. These are only stated in rough categories (e.g. "About a quarter") though and need to be transformed into numerical values.[16] The indicator then captures the effect of newly operating a NAHE or closing down an existing one (Tanzania), or moving from not at all to completely depending on a NAHE (Ethiopia).[17]

5.6 Control variables

In the following, the control variables included in the regressions below are discussed. An important determinant of short-term poverty trends which has to be controlled for is rainfall (Rosenzweig and Binswanger, 1993). Rijkers and Söderbom (2013) show that rainfall shocks not only affect the agricultural, but also the rural non-farm economy, as the latter is closely linked to the former. Two ways of capturing such effects are employed: For more localized effects, the district- (Tanzania) / woreda- (Ethiopia) level mean of a question on whether the household has been affected by a flood or drought over the last 12 months is used. In Ethiopia, the survey differentiates between the two weather events, whereas in Tanzania they are lumped together. To capture aggregate effects, region- (Ethiopia) / zone- (Tanzania) fixed effects per year are employed. Their derivation and maps showing their location are presented in the Appendix (Figure 9).

Closely related to rainfall shocks are local prices, which will not only affect the likelihood of selling

[15] In Tanzania, 69% of the studied households state cash or food crop sales as their main source of income, and only 3% state livestock-related sales, even though this figure rises to 9% for secondary sources of income). In Ethiopia, 8% of sampled farms in 2011 rely solely on livestock, 11% solely on crops, and 81% on both.

[16] The following numerical values were assumed for the categorical answers: "Almost none"=5%; "About a quarter"=25%; "About half"=50%; "About three quarters"=75%; "Almost all"=95%

[17] Other possible indicators would have been the time of household members devoted to working in the NAHE, which is not used because of different survey methodologies employed in the first waves of both surveys, or the number of household enterprises run, though it was judged that the move from no to some household business is the more significant one compared to adding another business to an existing one, where the boundaries between the two might not be clear.

one's produce, but also the measured consumption, in particular for food prices. It is attempted to control for this by including the median local price for the most commonly consumed grain.[18]

Another control employed on the household level is the number of working-age adults (15-64 years) in the household to account for changes in household composition through death, marriage or migration. It has been shown for Tanzania by Adhvaryu and Beegle (2009) that deaths of working-age households for example from HIV/Aids can have important long-term effects on the remaining members of the household.

A finding by Nagler and Naudé (2017) is that female-headed enterprises tend to be less productive than male-headed ones, potentially hinting at discrimination in access to markets and inputs like financial capital. The gender of the household head is therefore controlled for. Nagler and Naudé (2017) furthermore show that food insecurity may be an important push-factor determining the household strategies and is obviously highly correlated with the welfare measures employed. Therefore, a measure of the average health status per household is constructed (the household average of share of sick days over the last two months (Ethiopia) / the percentage of household members that have been hospitalized or visited a traditional healer (Tanzania)) and, in Ethiopia, the answer to the question whether the household has experienced food insecurity over the last 12 months as further control variables. It is acknowledged here that, especially for Tanzania, a more fine-grained indicator on the severity of illness would be useful, yet this could not be derived from the available data.

In the presence of remittances and government cash transfers, consumption and the likelihood of starting an enterprise or selling one's produce may be strongly affected by temporal payments to the household. In Ethiopia, the sum of total outside assistance is therefore controlled for, where in-kind donations are converted to cash equivalents in the survey. To this, income from land rental is added, which may also be taken as an external transfer independent of the household strategies under examination. Such a measure cannot be constructed for Tanzania. Relatedly, it is controlled for whether the household has experienced a theft over the last year.

As shown by Wiggins and Hazell (2011) cited above, payoffs to the non-farm economy depend on prevalence of remittances, though data quality here is perhaps not satisfactory. For Ethiopia, the total amount of outside cash assistance stated by households in a given enumeration area is used. While this comprises cash transfers from within the region, it appears to be the closest measure of remittance

[18] Following the survey methodology, I take as the local price the median of the village (or next lowest level of administration) price when at least ten households have reported the amount they paid for one kilogram of a particular commodity.

flows available. In Tanzania, data at this level of detail is not available. The analysis can therefore only rely on information on the primary and secondary source of household income, where answers include remittances. The enumeration area-average of households stating remittance as a source of income is then constructed, where households stating it as their primary source are weighted double. Though admittedly crude, this number will capture the reliance of a particular area on remittance inflows.

Finally, changes in the date of the interview over the course of the year are also controlled for. As consumption and NAHE activity likely underlies seasonal variations induced by rainfall patterns (Nagler and Naudé, 2017; von Carnap, forthcoming), the up-scaling of consumption information and information on NAHE activity are likely to be affected by the time of the survey. Table 3 shows the descriptive statistics of the variables employed.

Table 3: Descriptive statistics

	Mean	SD	Min; Max	Mean	SD	Min; Max
		Ethiopia			Tanzania	
Dependent variables						
Food Cons. (logged)	8.19	0.80	[6.21; 12.26]	12.88	0.61	[10.18; 15.40]
Non-food Cons. (logged)	7.89	1.10	[1.09; 11.10]	12.25	1.28	[7.09; 16.03]
Main explanatory variables						
NAHE	0.12	0.25	[0; 0.95]	0.42	0.49	[0; 1]
AMP	0.16	0.21	[0; 1]	0.24	0.26	[0; 1]
Distance measure						
dist_largetown	232.75	160.82	[8; 650]	344.40	185.67	[1.5; 650]
Controls						
workers	2.45	1.20	[1; 10]	2.59	1.57	[0; 24]
health	0.04	0.08	[0; 1]	0.07	0.15	[0; 1]
genderhead	0.76	0.43	[0; 1]	0.73	0.44	[0; 1]
theft	0.01	0.09	[0; 1]	0.15	0.36	[0; 1]
remitdep	4124.88	11826.3	[0; 128500]	0.07	0.10	[0; 0.63]
lnprice	3.45	0.63	[1.93; 5.41]	8.17	0.58	[6.21; 9.41]
otherincome	542.05	4062.68	[0; 142800]			
floods	0.02	0.07	[0; 0.89]			
droughts	0.18	0.30	[0;1]			
foodinsec	0.30	0.46	[0; 1]			
extremeclimate				0.30	0.15	[0; 1]

Descriptive statistics based on data provided by World Bank (2015b).

6 Results

The following sections in turn present the results from the econometric models developed in Section 5.3, before Section 7 explores their robustness.

6.1 Consumption effects of NAHE and AMP

Table 4 shows the results of Regression (1) for the overall sample. As evident from the estimates for β_1, engaging in NAHE significantly increases non-food consumption in Ethiopia and food consumption in Tanzania. Households that move from not at all to completely relying on household enterprises c.p. increase their consumption of non-food items by 22.2%, a sizable effect, while there is no effect on food consumption. In Tanzania, households starting a business significantly increase their consumption for only the food component, by an estimated 7.3%. The differential effects for the components could either reflect different patterns of price volatility between the two countries, or different propensities to spend increased income. Given the high prevalence of poverty however, it would be expected that increased income would primarily be used for food consumption in both countries. The effect on non-food consumption in Ethiopia thus suggests that fluctuating prices are behind the no-result for food. AMP has no significant effects on any consumption component in any of the countries. This is a contrary result to previous literature which often found positive welfare effects.

The number of working-age adults is a significant predictor in both countries and in all setups. For food, the negative coefficient likely stems from the division of overall household food consumption by adult equivalents which values adults disproportionately. For non-food consumption, the result is perhaps more intuitive, as an additional adult increases household non-food consumption by 14-21%. Worsening health is related to increasing food consumption in Tanzania. Suffering theft significantly increases non-food consumption in the farmer subsample of Ethiopia, possibly an effect of replacement acquisition of lost items. This is not the case in Tanzania though. Higher grain prices increase the value of food consumption in Ethiopia, perhaps driven by higher derived values for auto-consumption, given the absence of an effect on non-food consumption. Droughts significantly reduce consumption in Ethiopia, while extreme climate is found to only have a positive effect on non-food consumption in the Tanzanian farmer subsample. Contrary to previous research, no effect of remittance intensity on the payoffs of NAHEs can be detected. It is interesting to note that the model appears to perform better in both countries when using the less price-affected measure of non-food consumption and on average better in Tanzania than in Ethiopia, as measured by R^2.

Regarding H1 (positive consumption effects of AMP and NAHE in both countries), it can be concluded that the hypothesis is partly supported for NAHE and has to be rejected for AMP.

Table 4: Returns to NAHE and AMP for the whole sample (H1)

Strategy	NAHE				AMP			
Country	Ethiopia		Tanzania		Ethiopia		Tanzania	
Dep. Var	Food	Non-food	Food	Non-food	Food	Non-food	Food	Non-food
β_1	0.053	0.222	0.073	0.048	-0.073	-0.029	0.003	0.082
	(0.052)	(0.068)***	(0.019)***	(0.033)	(0.092)	(0.066)	(0.042)	(0.076)
year2	-0.061	0.361	0.078	0.286	0.164	0.257	0.024	0.382
	(0.183)	(0.158)**	(0.051)	(0.108)***	(0.109)	(0.113)**	(0.052)	(0.060)***
year3	0.149	0.382	0.262	0.477	-0.270	0.387	0.258	0.351
	(0.090)*	(0.133)***	(0.055)***	(0.078)***	(0.171)	(0.219)*	(0.074)***	(0.146)**
workers	-0.085	0.158	-0.057	0.212	-0.075	0.141	-0.052	0.202
	(0.013)***	(0.015)***	(0.011)***	(0.016)***	(0.016)***	(0.017)***	(0.013)***	(0.021)***
health	0.145	0.042	0.210	0.135	0.142	0.183	0.181	0.142
	(0.126)	(0.183)	(0.057)***	(0.082)	(0.186)	(0.198)	(0.072)**	(0.102)
genderhead	-0.084	0.098	-0.010	0.074	-0.134	0.140	0.010	0.008
	(0.050)*	(0.056)*	(0.051)	(0.134)	(0.080)*	(0.077)*	(0.060)	(0.159)
theft	0.122	0.021	0.033	0.031	0.069	0.235	0.022	0.018
	(0.084)	(0.105)	(0.022)	(0.034)	(0.108)	(0.103)**	(0.027)	(0.033)
remitdep	0.000	0.000	-0.022	-0.049	0.000	0.000	-0.022	-0.057
	(0.000)	(0.000)*	(0.109)	(0.156)	(0.000)	(0.000)	(0.135)	(0.161)
lnprice	0.097	-0.030	0.018	-0.033	0.103	-0.039	0.019	-0.002
	(0.043)**	(0.050)	(0.028)	(0.037)	(0.056)*	(0.057)	(0.034)	(0.045)
otherincome	0.000	0.000			-0.000	0.000		
	(0.000)	(0.000)			(0.000)	(0.000)		
floods	0.172	0.506			0.246	0.466		
	(0.189)	(0.356)			(0.236)	(0.384)		
droughts	-0.116	-0.079			-0.173	-0.098		
	(0.066)*	(0.068)			(0.078)**	(0.077)		
foodinsec	0.019	-0.070			0.033	-0.048		
	(0.031)	(0.032)**			(0.038)	(0.034)		
extremeclimate			0.100	0.141			0.169	0.309
			(0.084)	(0.128)			(0.105)	(0.140)**
R^2	0.03	0.12	0.18	0.21	0.03	0.13	0.18	0.27
N	10,367	10,367	5,794	5,802	7,005	7,005	4,529	4,534
Household-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reg.-Year-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Date of Intrvw.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; SE clustered at village/community level

6.2 Selection into NAHE and AMP by distance rings

Table 5 shows the results of Regression (2). It is found that the β_1 coefficients do not differ systematically by distance. In the Ethiopian case, households in some of the more remote distance rings have a c.p. 8-11 percentage points lower dependence on NAHEs than the most remote households, though only at low levels of significance. No such effect is found for AMP. Null hypotheses of all coefficients being zero cannot be rejected at conventional levels of significance with an F-test for both indicators ($p_{NAHE} = 0.125$; $p_{AMP} = 0.134$).

In Tanzania, farms in the fifth distance ring devote 6 percentage points more of their land to the market, though no such effect is found for neighboring districts, and market participation is significantly less in the 600km- and 150km-groups. These two effects likely also drive the rejection of the null

Table 5: Selection into NAHE / AMP by distance to closest large town (H2)

Strategy	NAHE		AMP	
Country	Ethiopia	Tanzania	Ethiopia	Tanzania
β_1^{50km}	-0.023	0.024	0.096	-0.006
	(0.054)	(0.061)	(0.094)	(0.038)
β_1^{100km}	-0.060	0.027	0.007	-0.034
	(0.045)	(0.058)	(0.055)	(0.031)
β_1^{150km}	-0.083	0.014	-0.009	-0.076
	(0.047)*	(0.062)	(0.061)	(0.030)**
β_1^{200km}	-0.062	0.053	-0.005	-0.032
	(0.046)	(0.061)	(0.054)	(0.028)
β_1^{250km}	-0.042	0.004	0.054	0.062
	(0.054)	(0.061)	(0.059)	(0.033)*
β_1^{300km}	-0.023	0.008	-0.014	-0.007
	(0.052)	(0.063)	(0.046)	(0.031)
β_1^{350km}	-0.078	0.045	0.051	-0.015
	(0.047)*	(0.061)	(0.051)	(0.028)
β_1^{400km}	-0.056	0.040	-0.032	-0.063
	(0.049)	(0.072)	(0.051)	(0.031)**
β_1^{450km}	-0.094	-0.053	-0.068	-0.034
	(0.046)**	(0.060)	(0.058)	(0.028)
β_1^{500km}	-0.059	0.039	-0.057	0.014
	(0.045)	(0.065)	(0.054)	(0.034)
β_1^{550km}	0.027	0.025	-0.045	-0.053
	(0.056)	(0.073)	(0.071)	(0.030)*
β_1^{600km}	-0.107	-0.037	-0.010	-0.062
	(0.060)*	(0.061)	(0.057)	(0.023)***
year2	0.066	0.013	0.100	0.013
	(0.032)**	(0.071)	(0.045)**	(0.082)
year3	0.038	-0.046	0.025	-0.101
	(0.045)	(0.055)	(0.055)	(0.074)
workers	0.004	0.001	0.030	0.000
	(0.003)	(0.003)	(0.005)***	(0.003)
health	-0.077	-0.014	0.087	0.070
	(0.028)***	(0.041)	(0.043)**	(0.026)***
genderhead	-0.039	0.027	0.014	0.052
	(0.010)***	(0.007)***	(0.019)	(0.010)***
theft	0.033	-0.007	0.132	0.008
	(0.031)	(0.024)	(0.018)***	(0.012)
remitdep	0.000	-0.000	-0.067	-0.253
	(0.000)*	(0.000)***	(0.105)	(0.056)***
lnprice	0.035	0.010	0.037	0.039
	(0.014)**	(0.013)	(0.026)	(0.013)***
otherincome	0.000	0.000		
	(0.000)***	(0.000)		
floods	-0.063	-0.112		
	(0.050)	(0.074)		
droughts	-0.053	-0.049		
	(0.017)***	(0.017)***		
foodinsec	-0.009	-0.030		
	(0.009)	(0.008)***		
extremeclimate			0.079	0.039
			(0.086)	(0.055)
R^2	0.05	0.10	0.04	0.07
N	10,551	7,109	5,801	4,534
Household-FE	No	No	No	No
Region-FE	Yes	Yes	Yes	Yes
Reg.-Year-FE	Yes	Yes	Yes	Yes
Date of Intrvw.	Yes	Yes	Yes	Yes

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; SE clustered at village/community level

hypothesis in the following F-test. For NAHE, the null hypothesis of zero effects can again not be rejected ($p_{NAHE} = 0.685$; $p_{AMP} = 0.011$).

It can thus be concluded that distance is not a relevant predictor of participation in the identified strategies. This is interesting, as it suggests that AMP and NAHE activities are distributed rather uniformly across space with respect to large towns, providing evidence that there does not exist a household-level characteristic differing across space driving the results of the fixed-effect analysis. It will thus be interesting whether their profitability differs with distance.

Regarding the other control variables, there appears to be a surge in NAHE activity in Tanzania over the survey period, especially in 2010, and a decrease in market participation in Ethiopia in 2015. Women-headed households there rely four percentage points more on NAHEs, yet they devote significantly less land to the market in both countries. Rises of food prices lead to more land being devoted to market production in Tanzania. Interestingly for Ethiopia, rising prices appear to stimulate NAHE activity. This, together with the negative effect for drought, hints at the linkages between the agricultural and the rural non-farm economy. For the countries as a whole, NAHEs thus appear not as a coping mechanism, but rather a way to tap into buoyant markets. AMP in Ethiopia is similarly reduced by droughts and food insecurity, indicating the marketing of surpluses from crops grown for own consumption, as opposed to strictly market oriented production.

To sum up, the evidence from this section does not support H2, as households appear to select in and out of both NAHE and AMP independent of the distance to large towns.

6.3 Consumption effects of NAHE and AMP by distance rings

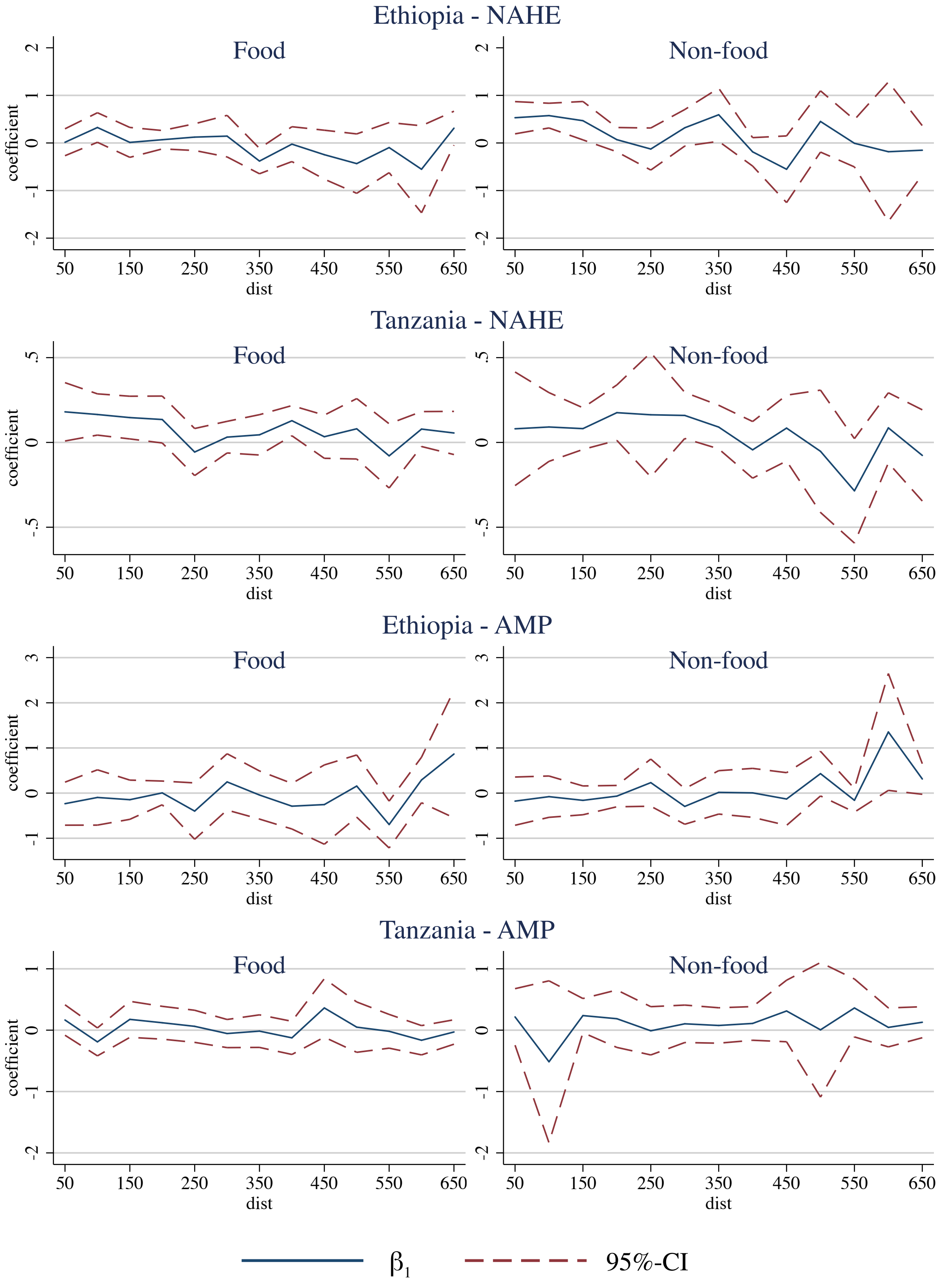
Table 6 and Figure 5 present the results from Regression (3). It is found that entry into NAHE and AMP affect the consumption measures very differently for both countries and consumption measures, though a couple of results in line with H3 (higher payoffs in less remote areas) emerge. The positive effect of the NAHE indicators on non-food consumption in Ethiopia and food consumption in Tanzania in both cases appear to be driven by the least remote areas, and F-tests on all distance coefficients being zero are strongly rejected ($p = 0.000$ for non-food in Ethiopia; $p = 0.0016$ for food in Tanzania). With the exception of the estimate for 350km (Ethiopia) and 400km (Tanzania), NAHE has zero or even negative payoff in all other regions. Furthermore, the point estimates for Tanzania suggest an effect that is decreasing with distance. This effect is also quantitatively large, as it increases non-food consumption by 57.5% in Ethiopia, and food consumption by 13.5%-18% in Tanzania. Note that

Table 6: Returns to NAHE and AMP by distance to closest large town (H3)

Strategy	NAHE				AMP			
Country	Ethiopia		Tanzania		Ethiopia		Tanzania	
Dep. Var.	Food	Non-food	Food	Non-food	Food	Non-food	Food	Non-food
β_1^{50km}	0.015 (0.144)	0.531 (0.173)***	0.180 (0.088)**	0.080 (0.171)	-0.234 (0.243)	-0.178 (0.273)	0.165 (0.127)	0.216 (0.235)
β_1^{100km}	0.325 (0.159)**	0.575 (0.132)***	0.165 (0.062)***	0.091 (0.103)	-0.096 (0.312)	-0.079 (0.234)	-0.191 (0.116)	-0.515 (0.673)
β_1^{150km}	0.012 (0.160)	0.468 (0.206)**	0.146 (0.064)**	0.081 (0.063)	-0.147 (0.221)	-0.161 (0.163)	0.176 (0.150)	0.238 (0.142)*
β_1^{200km}	0.069 (0.099)	0.069 (0.130)	0.135 (0.071)*	0.175 (0.083)**	0.004 (0.134)	-0.067 (0.121)	0.121 (0.136)	0.187 (0.239)
β_1^{250km}	0.123 (0.143)	-0.127 (0.225)	-0.057 (0.071)	0.163 (0.187)	-0.399 (0.318)	0.231 (0.267)	0.063 (0.134)	-0.010 (0.201)
β_1^{300km}	0.143 (0.223)	0.319 (0.196)	0.031 (0.048)	0.159 (0.069)**	0.248 (0.318)	-0.295 (0.201)	-0.055 (0.117)	0.104 (0.156)
β_1^{350km}	-0.380 (0.136)***	0.593 (0.285)**	0.045 (0.061)	0.090 (0.066)	-0.042 (0.272)	0.016 (0.245)	-0.015 (0.135)	0.077 (0.147)
β_1^{400km}	-0.025 (0.187)	-0.186 (0.152)	0.128 (0.045)***	-0.044 (0.085)	-0.289 (0.258)	0.006 (0.276)	-0.125 (0.138)	0.110 (0.140)
β_1^{450km}	-0.246 (0.262)	-0.553 (0.357)	0.033 (0.065)	0.084 (0.099)	-0.254 (0.448)	-0.131 (0.298)	0.363 (0.243)	0.313 (0.256)
β_1^{500km}	-0.434 (0.318)	0.452 (0.328)	0.080 (0.091)	-0.052 (0.184)	0.156 (0.351)	0.431 (0.252)*	0.050 (0.209)	0.006 (0.559)
β_1^{550km}	-0.097 (0.269)	-0.007 (0.253)	-0.079 (0.097)	-0.286 (0.157)*	-0.696 (0.265)***	-0.159 (0.134)	-0.018 (0.140)	0.362 (0.241)
β_1^{600km}	-0.553 (0.466)	-0.183 (0.747)	0.079 (0.052)	0.086 (0.106)	0.291 (0.257)	1.355 (0.660)**	-0.164 (0.122)	0.045 (0.162)
β_1^{650km}	0.311 (0.182)*	-0.152 (0.264)	0.056 (0.065)	-0.077 (0.137)	0.865 (0.721)	0.313 (0.173)*	-0.029 (0.102)	0.129 (0.129)
year2	-0.038 (0.188)	0.345 (0.160)**	0.071 (0.050)	-11.839 (0.113)***	0.160 (0.111)	0.244 (0.116)**	0.018 (0.051)	0.376 (0.060)***
year3	0.161 (0.092)*	0.360 (0.129)***	0.262 (0.056)***	0.473 (0.078)***	-0.287 (0.187)	0.318 (0.224)	0.257 (0.073)***	0.331 (0.145)**
workers	-0.085 (0.013)***	0.160 (0.015)***	-0.057 (0.011)***	0.212 (0.016)***	-0.075 (0.016)***	0.141 (0.017)***	-0.052 (0.013)***	0.201 (0.021)***
health	0.130 (0.127)	0.039 (0.184)	0.207 (0.056)***	0.134 (0.082)	0.152 (0.190)	0.191 (0.199)	0.178 (0.071)**	0.147 (0.103)
genderhead	-0.081 (0.049)	0.093 (0.056)*	-0.019 (0.051)	0.067 (0.136)	-0.146 (0.080)*	0.143 (0.076)*	0.013 (0.060)	0.010 (0.162)
theft	0.127 (0.084)	0.013 (0.105)	0.033 (0.022)	0.030 (0.034)	0.063 (0.107)	0.229 (0.102)**	0.022 (0.027)	0.016 (0.034)
remitdep	0.000 (0.000)	0.000 (0.000)*	-0.022 (0.108)	-0.048 (0.155)	0.000 (0.000)	0.000 (0.000)	-0.015 (0.135)	-0.057 (0.160)
lnprice	0.115 (0.044)***	-0.042 (0.048)	0.019 (0.027)	-0.017 (0.037)	0.120 (0.056)**	-0.078 (0.058)	0.018 (0.034)	0.005 (0.044)
otherincome	0.000 (0.000)	0.000 (0.000)			-0.000 (0.000)	0.000 (0.000)		
floods	0.180 (0.191)	0.522 (0.354)			0.284 (0.239)	0.486 (0.392)		
droughts	-0.121 (0.066)*	-0.076 (0.069)			-0.178 (0.078)**	-0.096 (0.077)		
foodinsec	0.018 (0.032)	-0.070 (0.032)**			0.036 (0.038)	-0.049 (0.033)		
extremeclimate			0.102 (0.084)	0.132 (0.128)			0.189 (0.106)*	0.334 (0.142)**
R^2	0.03	0.13	0.19	0.21	0.04	0.14	0.18	0.27
N	10,367	10,367	5,793	5,801	7,005	7,005	4,529	4,534
Household-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reg.-Year-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Date of Intrvw.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; SE clustered at village/community level

Figure 5: Returns to NAHE and AMP by distance to closest large town



these effects are not quantitatively comparable, as the indicators are constructed differently. It was found however that results are very similar when using the same definition for NAHE in Ethiopia as in Tanzania. Since the indicator for Ethiopia measures the somewhat more drastic move from not to completely relying on NAHE for household incomes, it is not surprising that the effects here are larger.

Furthermore and despite the no-result for NAHE on food consumption in Ethiopia, there is a positive effect on it in the second distance ring, while the result for the first ring is very imprecisely estimated. This can be taken as evidence that NAHEs in Ethiopia affect both components of consumption, even though an F-test rejects the null hypothesis of all distance coefficients being zero only at the 10% significance level. With some caution, these results can be taken as evidence that the threshold between the less and more remote rural areas in the model by Gollin and Rogerson (2014) would lie at around 150km road distance from major urban centers.

For AMP, the disaggregated analysis confirms the findings of Section 6.1 that AMP is not generally and nowhere in particular related to gains in any of the consumption components. Indeed, the null hypothesis of the F-test can not be rejected in any of the specifications.

These results suggest a fundamental difference in the way AMP and NAHE let households tap into demand structures. Both strategies, and AMP in particular, are remarkably unsuccessful across most of both countries studied, yet NAHE does increase some consumption components close to cities. In parallel to the results for H1, H3 has to be rejected for AMP, yet is strongly supported for NAHE.

6.4 Reverse causality and long-term effects

A potential concern with the evidence presented above could be that results are affected by reverse causality, i.e. that a however-caused increase in consumption frees up household resources to choose the strategies. For food consumption, this is less of a concern as numbers are scaled up from the previous-week's consumption, while NAHE only includes enterprises longer than one month in business, and AMP concerns the last harvesting season. For non-food consumption though, the questions cover a longer time span. In the following, the same analysis as above will therefore be performed with lagged indicator variables, based on Equation (4). While addressing reverse causality, this will also be informative on the longer-term effects of the strategies. The following regression is thus estimated

$$Cons_{itjk} = \beta_0 + \beta_1(IND_{it-1} \times distcat_j) + \beta_2 X_i^1 + \beta_3 X_{it}^2 + \beta_4 Z_{jt} + \beta_5 V_{kt} + \beta_6 W_t + \varepsilon_{it} \qquad (4)$$

where the only difference to Regression (3) is that IND is lagged by one period. It is expected that the β_1 in Regression (4) are similar to those found in Regression (3), mitigating concerns of reverse causality.

Figure 6 shows the results from this regression, while the underlying regression output is presented in Table 10 in the Appendix. It is a surprising finding that previous period's NAHE activity has a *negative* influence on both of today's consumption components in the least remote areas of Ethiopia, while again not having, except for the 400km group for non-food consumption, an effect in other areas. These results are similar for food consumption in Tanzania with a significant negative estimate in the least remote region. This could be taken as evidence that NAHE represent an adaptation strategy that makes it possible to increase consumption in the short run, but not to sustainably increase it, for example because land is no longer cultivated. It likely also reflects the prevalent patterns of frequent entry and exit (7% of sampled Ethiopian households did not run a NAHE in 2013, but in 2015; 9% did in 2013, but not in 2015; and only 14% did in both years; see also Liedholm (2007) cited above).

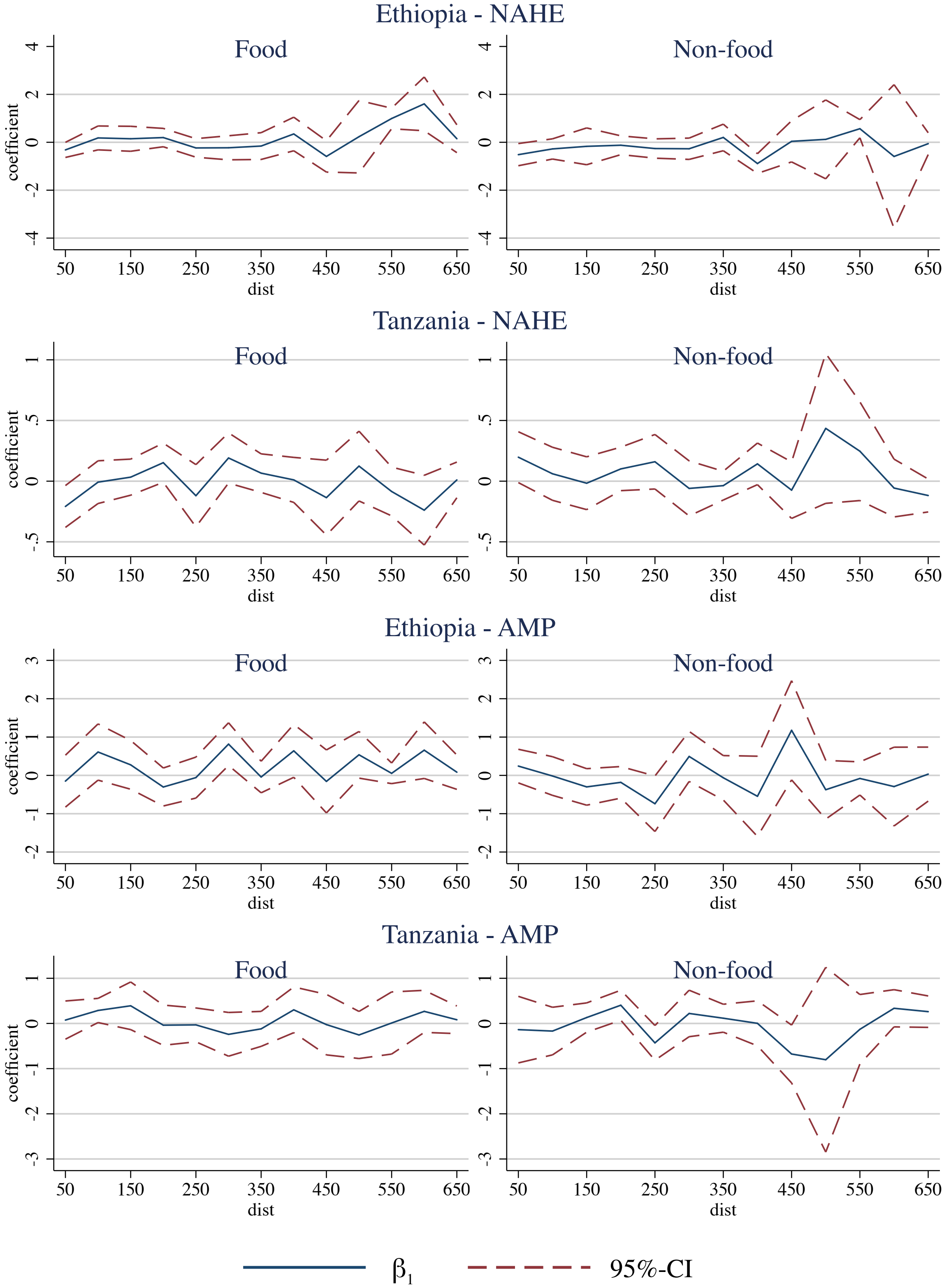
For AMP, the results from Regression (3) are confirmed in that there is no long term effect.

A concern with these results could be that they, rather than measuring longer-term effects, pick up effects from a particular year, since the lagging reduces the sample by one survey wave. Figures 10 and 11 in the Appendix show that this does not drive the negative long-term effects here, as results for Regression (3) are remarkably similar to those in Section 6.3 when taking shortened samples.

It has to be noted that results with lagged explanatory variables differ quite dramatically from the contemporaneous effects. However, volatility of business activity and the methodology of consumption measurement suggest that these mirror longer-term effects of the strategies rather than reverse causality.

Four sets of findings can be taken from the steps of analysis above before proceeding with the robustness checks. Firstly, NAHEs enable households to increase consumption components in both countries while AMP is not related with increased consumption. Secondly, there appears to be no differential propensity of households to choose strategies depending on their distance to towns. This contradicts the predictions by Gollin and Rogerson (2014) where market participation is only rational in less remote areas. Thirdly, the result for NAHE on non-food consumption in Ethiopia is driven by those households close to large towns, and the same is true for positive effects on food consumption in Tanzania. There is also a positive effect in less remote areas for food consumption in Ethiopia. There is no evidence for urban demand channels driving profitability of AMP in surrounding areas. Finally,

Figure 6: Lagged effects of NAHE and AMP by distance to closest large town



none of the effects persists in the periods after, and if any, is reversed in the least remote areas. While reverse causality appears to be less of a concern, this points at the volatility of business activity and failure of NAHEs to provide sustained increases in consumption.

7 Robustness analysis

As alluded to above in Section 3.1, previous literature has used different reference points for measures of distance. While the main part of the analysis focused on distance to large towns, other important reference points may be the primary city in each country, or the closest markets. The following section therefore repeats the analysis in Section 6.3 for these measures of distance. Thereafter, it is shown how the exclusion of formally employed households affects the result for NAHE, and whether hours worked in NAHE differ across areas, as an additional poverty measure. Finally, it is explored whether the observed effects for NAHE differ between cultivators and non-cultivators.

7.1 Different measures of remoteness - primary cities and market towns

Figure 7 shows the results of the same regressions as in Section 6.3, when using distance to the primary city (Addis Ababa and Dar es Salaam) to group observations.[19] The positive effect of NAHE on non-food consumption observed before appears to be partly, but not exclusively driven by households close to Addis Ababa. Similarly, the closest areas to Dar es Salaam drive the significant effect on food consumption, yet other cities must account for the effects in the second and third distance ring. Interestingly, there is a significant and negative effect on non-food consumption in the least remote areas in Tanzania, which appears to be reversed for AMP. Otherwise, AMP does not reveal a spatial pattern in relation to the primary city. It has to generally be noted that observations per group are much smaller when using this distance measure, so the estimates will be less precise. It can be noted from these results that distance to the primary city in both countries partly reflects patterns observed earlier, whereas including more cities makes them more intuitive and precisely estimated.

Figure 8 repeats the above analysis for distance to the closest weekly market, where observations are grouped in steps of 3km distance, and those above 24km are grouped together. Effects are mostly insignificant across distances, implying that distance to the market is not a relevant determinant of payoffs, confirming the findings by Owoo and Naudé (2016) that distance to market is not a predictor

[19]Due to insufficient observations in the third distance ring, there is no interpretable estimate for AMP in Tanzania in this ring.

Figure 7: Returns to NAHE and AMP by distance to primary city

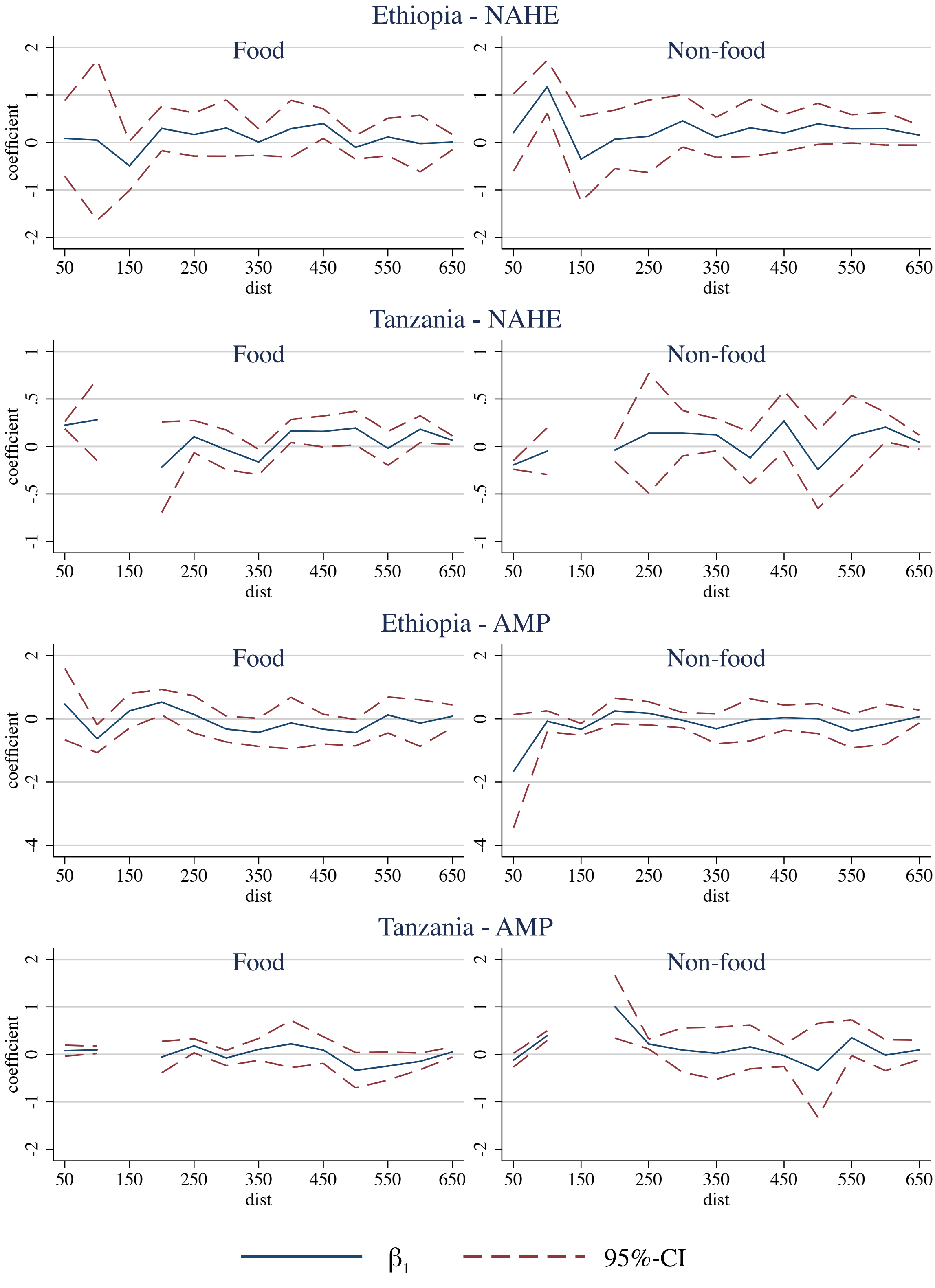
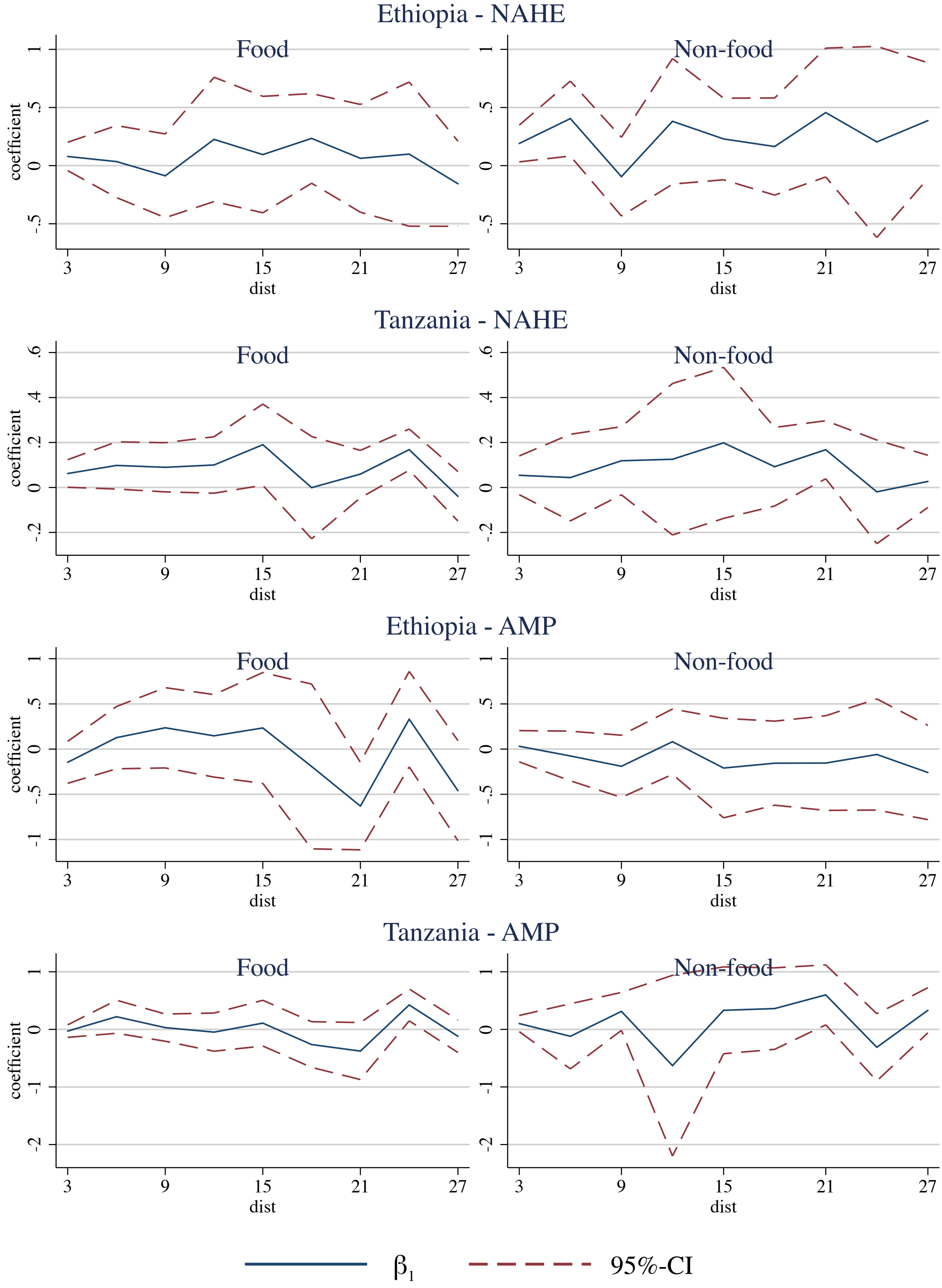


Figure 8: Returns to NAHE and AMP by distance to closest weekly market



of NAHE productivity in Ethiopia. An exception is again NAHE's effect on non-food consumption in Ethiopia, where the least remote households seem able to profit. Similarly for food in Tanzania, the effect is positive and almost significant for the least remote households, but also positive for some of the more remote groups. It can thus be concluded that market distance is not a reliable predictor of consumption payoffs.

The findings from this subsection support the choice of large towns as the relevant reference points. While the results using primary cities are qualitatively similar, it seems that including more cities leads to the estimates becoming more precise. Furthermore, an inclusion of a much larger number of urban areas would likely mask the effects found by using a more restricted set of cities, as evident from the analysis regarding market town distance.

7.2 Inclusion of formally employed

As explained in Section 5.1, households depending on formal employment are excluded from the main analysis, as their consumption arguably depends less on the market linkages studied here, but rather on a fixed salary provided by the employer. This exclusion affects 670 (6% of sample) and 438 observations (7%) in Ethiopia and Tanzania, respectively. It would be expected that their inclusion lets estimates of payoffs to NAHEs be generally lower, as starting a new venture would likely reflect loss of employment or infrequent salaries, thus being more of a coping mechanism.

Table 7 shows the results regarding this hypothesis, where the "Restricted" columns replicate the results from Table 6. The same controls are included, yet results are not shown for the sake of brevity. It can be observed that significance is rarely affected by including the formally employed, while the results for the least remote region support the hypothesis above. The point estimate for the (weakly) significant estimates is lower in the full sample, suggesting that starting a NAHE increases consumption more for the non-formally employed when urban demand is present. In more remote regions, point estimates for the significant effects are equal or even larger when including the formally employed. This could reflect different forms of formal employment, where jobs in peri-urban areas provide more stable and higher incomes than those further away.

It can generally be concluded from this subsection that excluding the formally employed does not structurally affect results, though their inclusion provides tentative evidence for demand effects driving the positive results for non-food consumption in Ethiopia and food in Tanzania.

Table 7: Inclusion of formally employed for NAHE payoff

Country	Ethiopia				Tanzania			
Dep. Var.	Food		Non-food		Food		Non-food	
Sample	Full	Restr.	Full	Restr.	Full	Restr.	Full	Restr.
β_1^{50km}	-0.018	0.015	0.452	0.531	0.093	0.180	0.265	0.080
	(0.120)	(0.144)	(0.159)***	(0.173)***	(0.089)	(0.088)**	(0.163)	(0.171)
β_1^{100km}	0.301	0.325	0.586	0.575	0.144	0.165	0.081	0.091
	(0.157)*	(0.159)**	(0.127)***	(0.132)***	(0.060)**	(0.062)***	(0.088)	(0.103)
β_1^{150km}	0.075	0.012	0.551	0.468	0.154	0.146	0.072	0.081
	(0.139)	(0.160)	(0.193)***	(0.206)**	(0.067)**	(0.064)**	(0.058)	(0.063)
β_1^{200km}	0.071	0.069	0.052	0.069	0.129	0.135	0.186	0.175
	(0.095)	(0.099)	(0.142)	(0.130)	(0.069)*	(0.071)*	(0.075)**	(0.083)**
β_1^{250km}	0.110	0.123	-0.064	-0.127	-0.008	-0.057	0.111	0.163
	(0.138)	(0.143)	(0.207)	(0.225)	(0.071)	(0.071)	(0.136)	(0.187)
β_1^{300km}	0.056	0.143	0.318	0.319	0.046	0.031	0.159	0.159
	(0.244)	(0.223)	(0.184)*	(0.196)	(0.045)	(0.048)	(0.068)**	(0.069)**
β_1^{350km}	-0.343	-0.380	0.621	0.593	0.050	0.045	0.088	0.090
	(0.119)***	(0.136)***	(0.240)***	(0.285)**	(0.057)	(0.061)	(0.073)	(0.066)
β_1^{400km}	0.030	-0.025	-0.147	-0.186	0.143	0.128	-0.014	-0.044
	(0.196)	(0.187)	(0.140)	(0.152)	(0.041)***	(0.045)***	(0.078)	(0.085)
β_1^{450km}	-0.230	-0.246	-0.554	-0.553	0.049	0.033	0.093	0.084
	(0.273)	(0.262)	(0.361)	(0.357)	(0.061)	(0.065)	(0.093)	(0.099)
β_1^{500km}	-0.433	-0.434	0.451	0.452	0.090	0.080	-0.043	-0.052
	(0.314)	(0.318)	(0.328)	(0.328)	(0.087)	(0.091)	(0.173)	(0.184)
β_1^{550km}	-0.070	-0.097	0.070	-0.007	-0.030	-0.079	-0.163	-0.286
	(0.261)	(0.269)	(0.240)	(0.253)	(0.078)	(0.097)	(0.138)	(0.157)*
β_1^{600km}	-0.555	-0.553	-0.287	-0.183	0.096	0.079	0.034	0.086
	(0.461)	(0.466)	(0.767)	(0.747)	(0.047)**	(0.052)	(0.107)	(0.106)
β_1^{650km}	0.315	0.311	-0.171	-0.152	0.063	0.056	-0.080	-0.077
	(0.181)*	(0.182)*	(0.264)	(0.264)	(0.058)	(0.065)	(0.127)	(0.137)
R^2	0.03	0.03	0.12	0.13	0.19	0.19	0.21	0.21
N	11,036	10,367	11,036	10,367	6,241	5,793	6,249	5,801
Household-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reg.-Year-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Date of Intrvw.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; SE clustered at village/community level; Restr. means the restricted sample excluding formally employed.

7.3 Hours worked after entry into NAHE by distance rings

A concern with the dependent variables employed above, especially food consumption, is that they are heavily affected by price fluctuations. Another measure of how profitable NAHEs are could therefore be how many hours households devote to them. A rational household would only dedicate more hours if gains are higher than from any alternative income source (this of course assumes that such other sources exist). It will therefore be instructive to see whether hours worked in NAHEs differ over space and whether these patterns are in line with the results found in Section 6.3. The surveys include questions on “unpaid labor in household businesses”, though this appears to include domestic chores in the first waves of both countries, as hours worked are by an order of magnitude larger. The second and third wave apply the same methodology and can therefore be used for the analysis. It would be

Table 8: Hours worked after entry, by distance rings

Country	Ethiopia	Tanzania
β_1^{50km}	16.528	2.152
	(11.883)	(2.547)
β_1^{100km}	16.017	8.127
	(7.562)**	(3.436)**
β_1^{150km}	8.855	0.300
	(5.453)	(0.414)
β_1^{200km}	18.183	4.545
	(10.589)*	(2.198)**
β_1^{250km}	16.873	0.688
	(7.096)**	(0.828)
β_1^{300km}	56.984	4.058
	(11.616)***	(2.679)
β_1^{350km}	18.562	4.575
	(4.776)***	(2.247)**
β_1^{400km}	8.743	5.368
	(10.601)	(1.993)***
β_1^{450km}	18.904	5.021
	(16.043)	(5.090)
β_1^{500km}	34.583	2.197
	(14.401)**	(1.664)
β_1^{550km}	34.176	2.513
	(4.794)***	(2.200)
β_1^{600km}	13.357	3.209
	(14.772)	(1.674)*
β_1^{650km}	19.935	6.666
	(12.107)	(1.915)***
year3	-0.037	-3.819
	(3.593)	(3.014)
workers	2.177	0.851
	(0.855)**	(0.502)*
health	0.530	-3.357
	(3.709)	(1.769)*
genderhead	0.603	2.708
	(1.891)	(1.620)*
theft	4.416	2.172
	(3.685)	(1.288)*
remitdep	-0.000	-2.621
	(0.000)	(4.809)
lnprice	0.319	-1.152
	(1.232)	(1.422)
otherincome	-0.000	
	(0.000)*	
floods	0.477	
	(6.477)	
droughts	0.071	
	(1.596)	
foodinsec	0.075	
	(0.778)	
extremeclimate		5.298
		(3.379)
R^2	0.07	0.06
N	6,988	3,820
Household-FE	Yes	Yes
Reg.-Year-FE	Yes	Yes
Date of Intrvw.	Yes	Yes

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; SE clustered at village/community level

expected that the geographical patterns found for NAHE payoffs in Section 5.3 are confirmed in hours worked.

Table 8 shows the results of Regression (3) with hours worked per household as the dependent variable. The evidence does not support the hypothesis sketched above. Hours worked after entry do not show an intuitive geographical pattern, and in particular are not higher in less remote areas, as the positive results for non-food consumption in Ethiopia and food consumption in Tanzania lead to expect. It seems questionable though whether hours worked are a relevant indicator here, as poverty and absence of other income opportunities may lead households to devote all their available time to an activity with only marginal returns. If the reasons for engaging in NAHE are different between less and more remote areas, a pattern would not necessarily be detectable.

7.4 Differential NAHE effects between landholders and the landless

A final, more explorative question that can be addressed with the data at hand is what characterizes the households benefitting from proximity to large towns. It was argued above that NAHEs perform an important safety function, especially for the landless and otherwise marginalized populations. It will therefore be interesting whether the results from Section 6.3 differ between those with and without access to agricultural land, where the former is the same group studied in the AMP analysis. To this end, Regression (3) is run separately for these two groups, the results of which are presented in Table 9. It is observed that the effect on food consumption in the proximate areas for Ethiopia is not visible in either of the groups, indicating the result to be only detectable with larger sample sizes. For non-food, it is interesting to observe that the effect is prevalent in both groups, yet a lot stronger for non-cultivators. This indicates that NAHEs in Ethiopia are a particularly important channel for the rural non-farming population in well connected areas. In more remote areas, the effect is often significant and negative, indicating that the function of NAHE here is rather one of coping with shocks.

In Tanzania, the positive results for food are in turn driven by the farming population, providing further evidence for different processes in this country. It has to be noted that there are no non-farming households sampled in the third distance ring, which is why this category is left empty. Interestingly, NAHEs help the most remote, non-agricultural households to increase their food and non-food consumption.

It can be concluded from this analysis that important differences exist between farming and non-farming populations' payoffs to NAHE activity. In Ethiopia, it appears that NAHEs present a sub-

Table 9: Differential effects between cultivators and non-cultivators

Country	Ethiopia				Tanzania			
Dep. Var.	Food		Non-food		Food		Non-food	
Cultivators	Yes	No	Yes	No	Yes	No	Yes	No
β_1^{50km}	-0.062	0.101	0.483	0.495	0.087	0.122	0.085	0.097
	(0.150)	(0.208)	(0.200)**	(0.257)*	(0.123)	(0.175)	(0.091)	(0.428)
β_1^{100km}	0.400	0.233	0.477	0.731	0.185	-0.120	0.150	-0.119
	(0.289)	(0.220)	(0.155)***	(0.279)***	(0.078)**	(0.050)***	(0.138)	(0.095)
β_1^{150km}	-0.130	0.107	0.213	0.736	0.136		0.084	
	(0.197)	(0.292)	(0.219)	(0.322)**	(0.063)**		(0.067)	
β_1^{200km}	0.209	-0.105	-0.004	-0.047	0.127	0.160	0.180	0.314
	(0.190)	(0.103)	(0.206)	(0.148)	(0.083)	(0.148)	(0.103)*	(0.386)
β_1^{250km}	-0.067	0.317	0.142	0.047	-0.100	0.088	-0.006	1.403
	(0.313)	(0.206)	(0.364)	(0.255)	(0.118)	(0.279)	(0.094)	(1.430)
β_1^{300km}	0.499	-0.065	0.252	0.381	0.091	-0.028	0.127	0.202
	(0.349)	(0.262)	(0.306)	(0.240)	(0.060)	(0.204)	(0.086)	(0.227)
β_1^{350km}	-0.557	0.141	0.443	0.772	0.045	0.304	0.084	0.229
	(0.224)**	(0.232)	(0.235)*	(0.585)	(0.052)	(0.193)	(0.078)	(0.166)
β_1^{400km}	-0.011	0.109	0.267	-0.518	0.127	0.131	-0.033	0.149
	(0.335)	(0.249)	(0.350)	(0.290)*	(0.062)**	(0.133)	(0.075)	(0.174)
β_1^{450km}	-0.732	0.063	-0.552	-0.641	0.016	0.200	0.018	0.312
	(0.402)*	(0.335)	(0.180)***	(0.638)	(0.079)	(0.165)	(0.102)	(0.567)
β_1^{500km}	-0.314	0.311	0.423	-0.057	0.046	-0.156	-0.111	-0.892
	(0.475)	(1.360)	(0.306)	(0.851)	(0.106)	(0.137)	(0.192)	(0.165)***
β_1^{550km}	-0.134	-0.274	-0.139	0.122	-0.193	0.241	-0.303	-0.526
	(0.613)	(0.173)	(0.385)	(0.338)	(0.120)	(0.057)***	(0.190)	(0.110)***
β_1^{600km}	-1.777	-0.224	0.929	-1.457	0.019	0.428	-0.022	-0.256
	(0.105)***	(0.241)	(1.171)	(0.634)**	(0.071)	(0.184)**	(0.137)	(0.154)*
β_1^{650km}	0.429	-0.193	0.154	-0.575	0.054	0.215	-0.010	0.201
	(0.260)*	(0.152)	(0.191)	(0.343)*	(0.070)	(0.240)	(0.141)	(0.198)
R^2	0.04	0.06	0.14	0.17	0.19	0.25	0.27	0.14
N	7,005	3,362	7,005	3,362	4,529	1,264	4,534	1,267
Household-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reg.-Year-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Date of Intrvw.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; SE clustered at village/community level; No observations in third distance ring for non-cultivators in Tanzania.

stitute for farming for the households that do not own or rent land. In Tanzania in turn, it appears to be more of a complement, since the positive results for food found before are driven by farmers. Distance is a relevant determinant of payoffs in both cases, yet effects here also differ strongly between the countries.

8 Discussion

The following section discusses the internal and external validity of the analysis above. A first concern is the validity of the chosen distance measure. While the robustness analysis suggests that using large towns as the reference points helps to capture relevant dynamics, the road kilometer distance can still only be indicative of actual transport costs and travel time. This shortcoming is acknowledged, yet the measure is still argued to be more instructive and less error-prone than other commonly used ones, such as Euclidean distance or cost of travel by public transport where definitions across villages may differ strongly. Furthermore, road quality in Ethiopia (Dorosh and Schmidt, 2010) and Tanzania (Shkaratan, 2012) roughly decreases with distance from the main towns. To the extent that the decrease in road quality and speed of travel is roughly proportional to the distance from large cities, the kilometer distance should thus capture differences in accessibility. However, an interesting improvement to the current study would be to use GIS-based data on travel times in order to get a more accurate measure of remoteness.

The differential effects between food and non-food consumption described above likely reflect the importance of prices in the analysis. This is underlined by the findings for an asset indicator constructed during this research project where effects were found to be similar to those for non-food consumption (see Figure 12 in the Appendix). While it is methodologically difficult to construct more detailed measures for inflation than what the locality-year fixed effects and the price variable can capture, it would obviously simplify the analysis of whether and why effects between the two components differ. Furthermore, previous research on microcredit effects has found varying impacts on consumption components (Banerjee et al., 2015a), with some evidence suggesting increased investments in durable assets related to the enterprise (Augsburg et al., 2015; Banerjee et al., 2015b). Further analysis could disentangle the composition of non-food consumption to see whether the positive effect in Ethiopia reflects such investments.

An important abstraction taken above is the exclusion of livestock farmers in the AMP analysis, and it was argued that, given the market-oriented production of herders, it provides an estimate of the lower bound of the effect of AMP. Given the difficulties associated with transportation and storage of agricultural products in general and meat in particular, it seems unlikely that remote areas would have pastoralists gaining strongly from urban demand, but rather so in the vicinity of urban areas. While it would be desirable to include pastoralists in the analysis (especially in Ethiopia where herding is more prevalent), there seems to be no readily derivable measure of market participation that includes both crop farmers and pastoralists.

This study presents an attempt to estimate poverty effects of market participation using nationally representative panels. While sample sizes exceed previous panel studies on the topic by an order of magnitude, it would be desirable to collect even more observations in order to distill out the effects of interest in the presence of multiple shocks and other dynamics. Future releases of data for Ethiopia might make this possible. Furthermore, more accurate price data would let one examine real changes in consumption, while the data currently appears to be too faulty for such a measure to be constructed.

The methodology applied for this study could also be transferred to other countries covered under the LSMS-ISA project (Malawi, Nigeria, Uganda) in order to compare transformation processes between these countries. While obviously every country has its very own characteristics (this also being the reason why the two panels were not pooled in this study), all countries except perhaps Nigeria share their reliance on smallholder agriculture for economic growth and poverty reduction. A comparative analysis between countries would require a deeper understanding and analysis of the respective institutional context, especially with regards to market policies. While it was found in Section 4.3 that both countries studied here have relatively liberalized agricultural and thus rural markets, this analysis is not fine-grained enough to allow between-country comparisons.

Finally, it will be important to assess the economic significance of the effects found. The estimates suggest that large gains in terms of non-food consumption (Ethiopia) and food consumption (Tanzania) are possible from running a NAHE in areas close to cities, while AMP does not promise returns in terms of consumption anywhere across the geographic space. Increased participation in NAHE would obviously at some point lead to market saturation, yet there are large gains to be had from improving access to urban markets through both infrastructural investments and by easing the commonly cited constraints on NAHE activity like access to finance. Further research could compare costs and benefits of such policies to alternative poverty alleviation measures.

9 Conclusion and policy implications

This thesis studied the interplay between two features of structural transformation in Ethiopia and Tanzania: the growth of urban areas and increased market activities of rural households. Specifically, it explored whether agricultural market participation (AMP) and non-agricultural household enterprises (NAHE) let households increase their consumption to different extents depending on their proximity to urban markets. It was found that households in less remote areas can significantly increase their nonfood (Ethiopia) and food (Tanzania) consumption by starting a NAHE, and there is some evidence for a similar effect on food consumption in Ethiopia. Prices of consumption goods appear to play an important role in determining these payoffs, and increases to consumption are not always sustained over time. The observed effects in Ethiopia are stronger for the non-farming rural population, yet the opposite is true in Tanzania, indicating substantial differences in the transformation processes between the two countries. It has to be noted that NAHEs do not pay off in the more remote regions, indicating it being an adaptive strategy there. AMP for field-grown crops does not lead to increased consumption on aggregate, and no spatial pattern is discernible. Interestingly though, households' engagement in the strategies does in no predictable way depend on their remoteness, contradicting the implications of the model by Gollin and Rogerson (2014). Robustness checks underlined the validity of the chosen distance measure and the exclusion of formally employed in the main analysis. Moreover, the spatial patterns in terms of payoff to NAHEs were not reflected in an analysis of the hours worked in such businesses, indicating the different reasons of engagement across the geographic space.

Two important policy recommendations can be derived from these findings: Firstly, it appears questionable whether a push for agricultural commercialization would, besides the intended effects of market deepening, lead to lower poverty levels among farmers, at least in the short run. Low market participation therefore appears to be a rational strategy on behalf of the farmer, and significant institutional changes in agricultural markets would be required to make engagement profitable. A simple reliance on urban demand effects and export markets would likely not lead to the intended poverty reductions, mirroring the findings by Gollin et al. (2015) where African cities are found to be growing not as a result of higher productivity there, but rather on the back of resource exports.

Secondly, non-agricultural household enterprises present an important channel for households to diversify and increase their income, yet only so when sufficient demand for their services exists. It appears that running a NAHE reflects a decision to exploit available business opportunities in less remote areas, while otherwise it may be more of a coping mechanism with adverse shocks, as indicated by the absence of consumption gains in more remote regions. This suggests that policymakers should not embrace supporting enterprises across the country, but rather link them better to existing markets where possible, and address the push-factors driving households to start NAHEs in the areas where little gains are to be had.

The rich data provided under the LSMS-ISA program allows for detailed analysis, and future research could exploit these panels further. More accurate distance measures would help to identify the effects of urban proximity clearer. Here, the Ethiopian road extension program appears like a particularly interesting setting. An extension of the methodology developed and used here to other countries could reveal differential channels between countries and hint at entry points for policy. It will be useful for researchers and policy makers alike to gather more micro-evidence towards a better understanding of transformational processes in Africa.

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Appendix

Construction of locality-year fixed effects

In Ethiopia, I start based on the 11 regions which include three chartered cities (Addis Ababa, Dire Dawa and Harar). As all observations in Addis Ababa region are defined as urban, they are not included in the sample. Furthermore, Dire Dawa is assigned to the Somali region, and Harar to the Oromia region which it is encircled by. Finally, I split up the very large Oromia region into east and west for the purposes of the regression by assigning zones (the next-lowest administrative level) along a line through Addis Ababa to either side. Tanzanian regions are not comparable to the Ethiopian ones as they are much smaller, and therefore do not offer themselves as the appropriate reference categories. I thus use the zones suggested by the Demographic and Health Survey program (NBS et al., 2016) and used for stratification in the LSMS-ISA surveys, resulting in the six zones depicted in Figure 9.

Figure 9: Regions and zones used for fixed effects

Note: Maps not drawn to scale of each other.

Table 10: Lagged effects of NAHE and AMP by distance to closest large town

Strategy	NAHE				AMP			
Country	Ethiopia		Tanzania		Ethiopia		Tanzania	
Dep. Var	Food	Non-food	Food	Non-food	Food	Non-food	Food	Non-food
β_1^{50km}	-0.317	-0.516	-0.208	0.198	-0.151	0.242	0.075	-0.137
	(0.161)*	(0.236)**	(0.088)**	(0.107)*	(0.346)	(0.224)	(0.216)	(0.376)
β_1^{100km}	0.182	-0.277	-0.008	0.061	0.609	-0.017	0.288	-0.169
	(0.254)	(0.215)	(0.090)	(0.112)	(0.374)	(0.257)	(0.137)**	(0.269)
β_1^{150km}	0.147	-0.169	0.033	-0.017	0.274	-0.301	0.391	0.131
	(0.266)	(0.392)	(0.076)	(0.111)	(0.325)	(0.243)	(0.269)	(0.165)
β_1^{200km}	0.197	-0.123	0.152	0.101	-0.304	-0.183	-0.038	0.404
	(0.196)	(0.200)	(0.082)*	(0.091)	(0.253)	(0.210)	(0.227)	(0.170)**
β_1^{250km}	-0.236	-0.261	-0.120	0.160	-0.058	-0.741	-0.031	-0.430
	(0.198)	(0.206)	(0.131)	(0.115)	(0.273)	(0.370)**	(0.191)	(0.196)**
β_1^{300km}	-0.230	-0.270	0.191	-0.060	0.815	0.494	-0.241	0.221
	(0.256)	(0.227)	(0.106)*	(0.116)	(0.284)***	(0.333)	(0.247)	(0.262)
β_1^{350km}	-0.158	0.202	0.066	-0.037	-0.043	-0.063	-0.120	0.116
	(0.285)	(0.283)	(0.081)	(0.061)	(0.210)	(0.295)	(0.197)	(0.158)
β_1^{400km}	0.347	-0.888	0.010	0.143	0.640	-0.546	0.302	0.003
	(0.357)	(0.209)***	(0.095)	(0.087)	(0.353)*	(0.534)	(0.258)	(0.254)
β_1^{450km}	-0.591	0.040	-0.136	-0.074	-0.158	1.176	-0.026	-0.676
	(0.333)*	(0.438)	(0.157)	(0.119)	(0.419)	(0.660)*	(0.342)	(0.326)**
β_1^{500km}	0.232	0.121	0.124	0.435	0.537	-0.375	-0.255	-0.803
	(0.772)	(0.840)	(0.147)	(0.315)	(0.311)*	(0.391)	(0.266)	(1.043)
β_1^{550km}	0.994	0.566	-0.085	0.247	0.053	-0.080	0.010	-0.129
	(0.218)***	(0.194)***	(0.103)	(0.207)	(0.137)	(0.221)	(0.351)	(0.393)
β_1^{600km}	1.604	-0.591	-0.239	-0.057	0.657	-0.292	0.268	0.336
	(0.573)***	(1.530)	(0.147)	(0.121)	(0.377)*	(0.524)	(0.238)	(0.210)
β_1^{650km}	0.149	-0.058	0.010	-0.118	0.083	0.033	0.082	0.261
	(0.297)	(0.232)	(0.075)	(0.069)*	(0.228)	(0.360)	(0.156)	(0.178)
year3	0.125	0.229	0.435	0.094	-0.148	0.353	0.344	-12.576
	(0.138)	(0.109)**	(0.126)***	(0.087)	(0.193)	(0.160)**	(0.124)***	(0.136)***
workers	-0.073	0.162	-0.059	0.212	-0.074	0.165	-0.056	0.221
	(0.016)***	(0.020)***	(0.015)***	(0.021)***	(0.020)***	(0.023)***	(0.018)***	(0.030)***
health	-0.060	0.082	0.215	0.197	-0.390	0.174	0.204	0.156
	(0.154)	(0.243)	(0.084)**	(0.139)	(0.215)*	(0.209)	(0.099)**	(0.203)
genderhead	-0.059	0.070	0.028	-0.131	-0.044	0.063	0.036	-0.227
	(0.068)	(0.074)	(0.083)	(0.227)	(0.083)	(0.096)	(0.108)	(0.399)
theft	0.029	0.131	0.072	0.078	0.114	0.111	0.049	0.086
	(0.130)	(0.111)	(0.036)**	(0.069)	(0.171)	(0.128)	(0.045)	(0.075)
remitdep	0.000	0.000	-0.091	0.051	-0.000	0.000	-0.198	-0.123
	(0.000)	(0.000)	(0.141)	(0.222)	(0.000)	(0.000)	(0.190)	(0.312)
lnprice	0.160	-0.029	0.043	0.064	0.148	-0.068	0.069	0.102
	(0.056)***	(0.061)	(0.048)	(0.070)	(0.070)**	(0.063)	(0.057)	(0.083)
otherincome	-0.000	0.000			-0.000	-0.000		
	(0.000)	(0.000)			(0.000)***	(0.000)		
floods	0.133	-0.242			0.470	0.160		
	(0.384)	(0.570)			(0.479)	(0.769)		
droughts	-0.182	-0.029			-0.214	0.008		
	(0.092)**	(0.086)			(0.107)**	(0.089)		
foodinsec	0.025	-0.036			0.034	-0.036		
	(0.040)	(0.042)			(0.049)	(0.049)		
extremeclimate			0.143	0.292			0.219	0.173
			(0.105)	(0.154)*			(0.126)*	(0.181)
R^2	0.04	0.06	0.22	0.21	0.05	0.07	0.21	0.17
N	6,558	6,558	3,607	3,613	4,725	4,725	2,871	2,876
Household-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reg.-Year-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Date of Intrvw.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; SE clustered at village/community level

Figure 10: Returns to NAHE and AMP by distance to closest large town, excluding wave 1

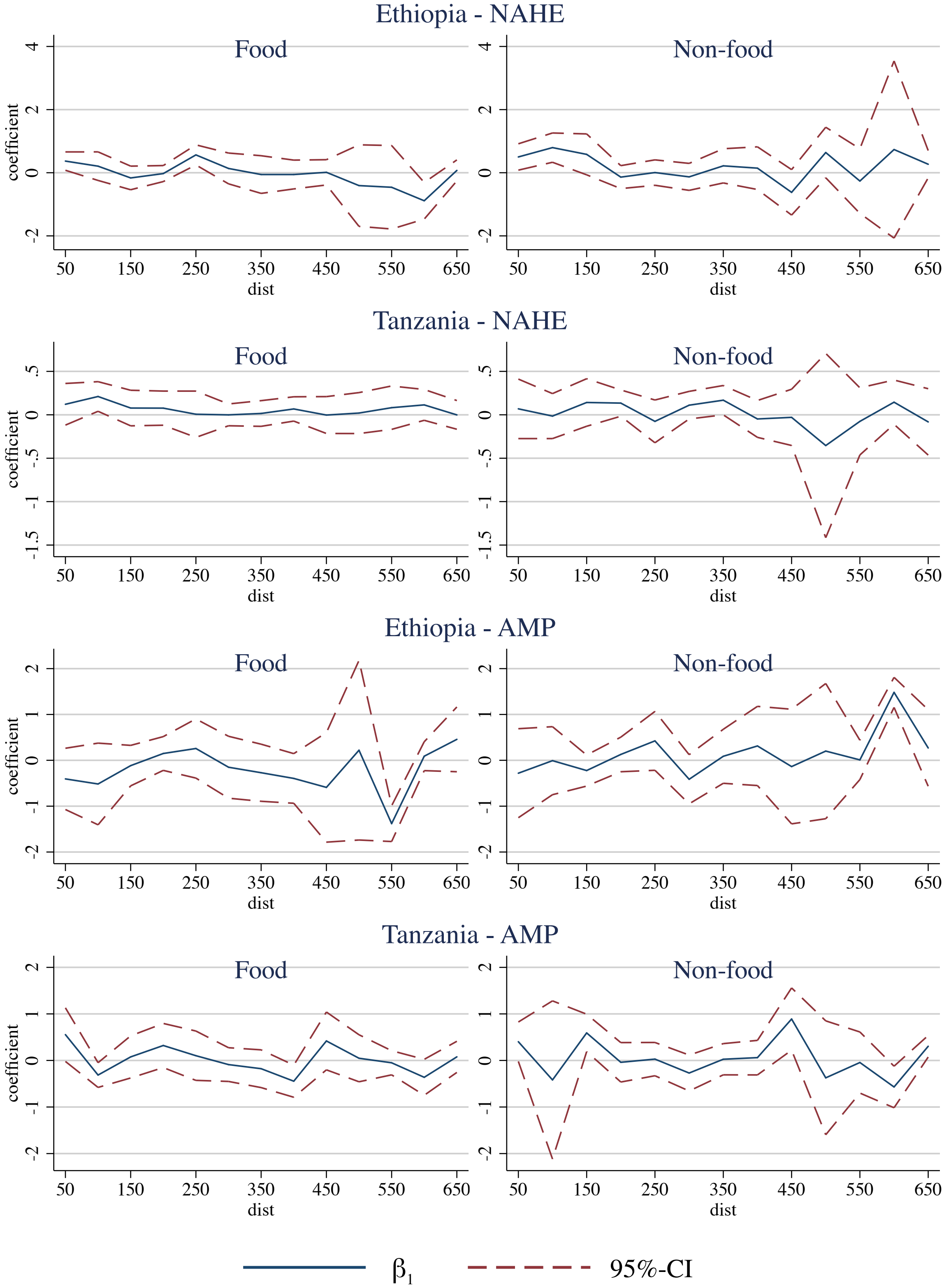


Figure 11: Returns to NAHE and AMP by distance to closest large town, excluding wave 3

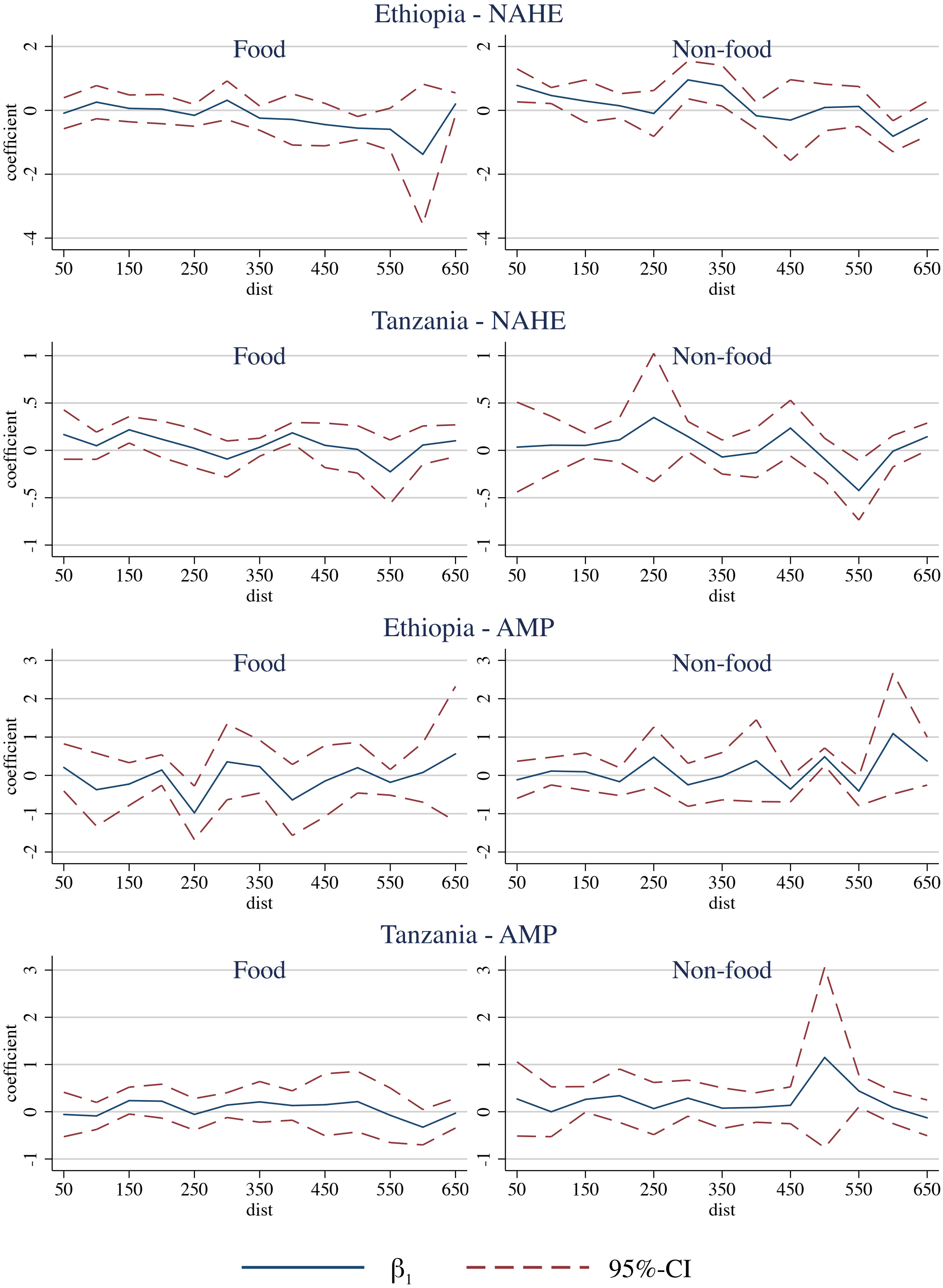
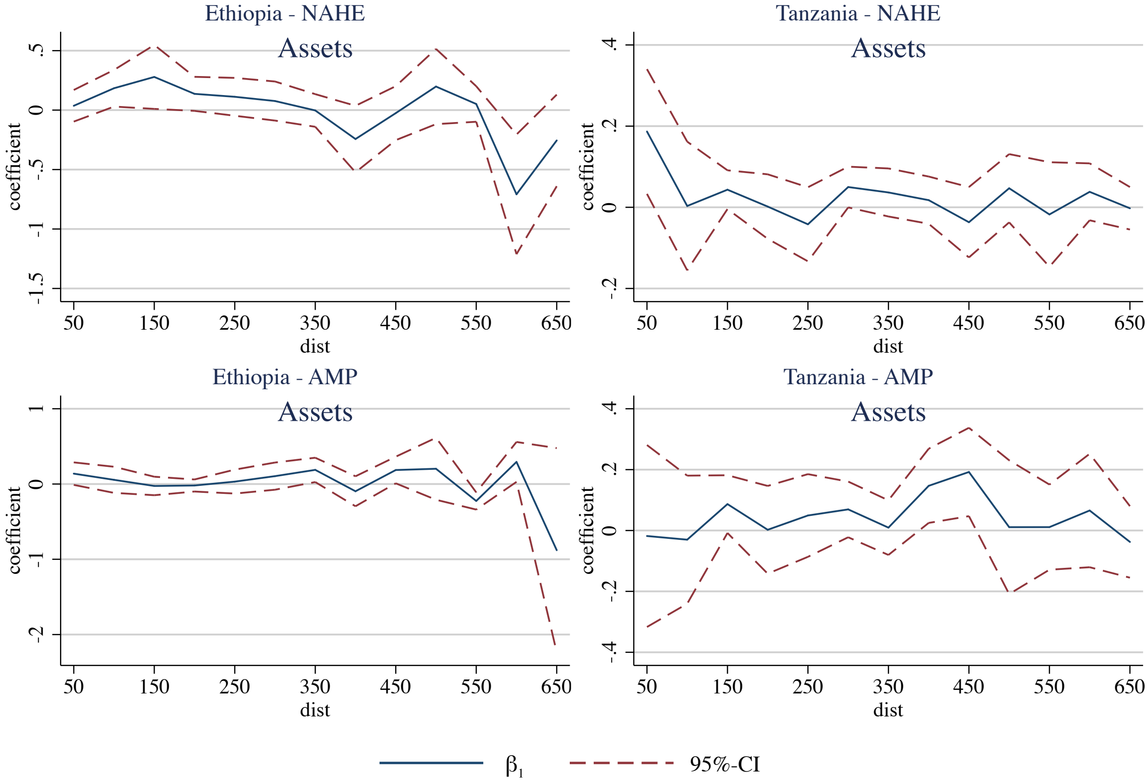


Figure 12: Effects of NAHE and AMP on an asset indicator, by distance ring



Note: The asset indicator captures the nonagricultural asset positions of households per individual. As assets are a a reflection of long-term trends affecting the household and their sales used to smoothen consumption, they may be more likely to capture welfare trends than the consumption variables (McKenzie, 2005; Filmer and Pritchett, 2001), yet there is no agreed framework for such an asset indicator to be constructed, and it was therefore decided to focus on the consumption components in the above analysis.. Out of the wealth of assets collected in the survey, only those which are strictly more likely to be owned in larger quantities by wealthier households are selected for the indicator. This for example excludes those goods people at low levels of income may possess, and less so at higher levels, e.g. bicycles. For Ethiopia, these assets are: blanket, mattress, watch, mobile phone, radio, television, satellite dish, sofa, shelf; for Tanzania, some, but not all these assets are collected: watch, mobile phone, radio, television, sofa, bed, fridge, shelf, chair. For each of the assets, the z-score is calculated using Stata's 'zscore' command. The z-score can be understood as how many standard deviations the asset position of a particular household is away from the mean, either negatively or positively. Since there is no natural or minimal level of assets any household possesses, this averaging arguably captures well the relative wealth position of a given household compared to all the others. The indicator then represents the average z-score across all the assets considered. A one-unit increase in the indicator can then be understood as a household having increased its relative asset position to other households by one standard deviation from one period to the next.