

## Chapter 1

# Is migration an effective adaptive and livelihood diversification strategy for rural families in arid regions of Namibia? An application of constructed instruments using heteroscedastic errors

Zachary M. Gitonga

School of Economics University of Cape Town

[zachgitonga@gmail.com](mailto:zachgitonga@gmail.com)

+27737940921

## Abstract

The nexus between migration as a livelihood diversification and adaptive option and the wellbeing of the rural families in arid and semi-arid regions remains a gap in literature. The focus in this paper is to evaluate the impact of migration on household consumption expenditure and dietary diversity. We use survey data from a representative sample of 653 households across three arid regions of Northern Namibia and employ Lewbel's constructed instruments approach for estimation. Lack of economic opportunities in the villages was the main reason for migration. Migrant households are poorer and have lower long-term consumption spending than those that have no migrants. However, migration intensity has a positive impact on annual consumption spending. We did not find significant impact of migration on short-term spending dietary diversity and adaptive capacity. We find tertiary level training and post school skills training to be key determinants of remittances received by migrant households. Most migrants however, are unskilled and very few have tertiary education. Equipping migrants with skills can greatly enhance the migration outcome in reducing vulnerability to climate risks and increasing resilience of rural families in arid regions. Due to self-reinforcing poverty traps in poor households, targeted public programs that support higher education and training are necessary to this end.

Key words: Namibia, semi-arid lands, migration outcome, vulnerability, climate risk, consumption spending dietary diversity<sup>i</sup>

---

<sup>i</sup> Paper prepared for the 2019 Economics PhD conference at Stellenbosch University

## **1.1. Introduction**

### **1.1.1. Overview**

The nexus between migration and the wellbeing of the rural families in arid and semi-arid regions remains a significant gap in literature. The assumption in many of the studies reviewed is a unidirectional flow of remittances from the migrants to their rural families but a study on migration in Namibia by Frayne (2004) indicate a reciprocal interaction through rural-urban linkages. Urban migrants who have limited social contact with their rural families are very vulnerable to food insecurity in the cities. Given that most rural households in arid regions of Southern Africa are classified as poor in national statistical agencies (Spear et al., 2014), the impact of migration on household wellbeing is not obvious across different social groups. Rural-urban migration has been on the increase in Namibia since independence and there is need for a better understanding of its impacts on the wellbeing of the rural households most vulnerable to negative impacts of climate change. Urban poverty is increasing in cities and opportunities to find work are dwindling for most unskilled migrants (Frayne, 2004). In view of the foregoing, the impact of migration on rural households' wellbeing in Namibia is largely unknown. This study bridge this gap by characterizing the migration process in Namibia, analyzing the characteristics of migrants and evaluating the effect of migration on household consumption expenditure, food spending, dietary diversity and adaptive capacity.

### **1.1.2. Households' vulnerability to climate shocks in arid and semi-arid regions**

Arid and semi-arid lands are home to slightly more than a third of the world's population and comprise of over 40% of the earth's land surface (Fraser et al., 2011). One of the key features of semi-arid climates is rainfall variability and this is bound to increase with climate change. Climate change- induced droughts will most likely push the dryland ecosystems beyond the biophysical thresholds and lead to long-term decline in agricultural productivity, (Fraser et al., 2011). Batisani and Yarnal (2010) find evidence of a decreasing number of rainy days and increased duration of dry spells in Botswana. We can expect climate change to increase vulnerability to risks for societies dependent on resources that are sensitive to changes in climate variability (Adger, Huq, Brown, Conway, & Hulme, 2003; Conway & Schipper, 2011). This will most likely make subsistence agriculture a less viable source of livelihood and households will have to diversify their income sources to survive. In Namibia, climate change poses future risks of economic decline which will negatively affect employment opportunities and wages especially for the poor and unskilled workforce (Reid, 2007; Reid, Sahlén, Stage, & MacGregor, 2008). The frequency and

intensity of extreme events like droughts will increase and the projection of temperature rise by 2100 is between 2°C and 6°C (Reid, 2007; Reid et al., 2008). Livestock farmers in Namibia are likely to suffer huge losses due to shrinking pastures and small farm units will not be viable (Reid et al., 2008).

### **1.1.3. Past responses to climate-related risks**

To address the risks related to climate change, scholars have proposed several interventions at both national and farm level. One such intervention is the use of climate insurance as an instrument for ex-ante risk reduction that allow countries most affected by climate change to purchase insurance-like products to cover specific climate risks (Bals, Warner, & Butzengeiger, 2006; Linnerooth-Bayer & Mechler, 2006). This idea however has not received much attention due to technical and political ramifications.

At the farm level, index-based crop and livestock insurance are instruments for risk transfer designed to overcome the shortcomings of indemnity-based insurance (Alderman & Haque, 2007; Barnett, Barrett, & Skees, 2008; Chantarat, Mude, Barrett, & Carter, 2013; Hazell & Hess, 2010; Jensen & Barrett, 2017; Mahul & Skees, 2007; Meze-Hausken, Patt, & Fritz, 2009). Some of the shortcomings of indemnity-based insurance include the high transactions<sup>1</sup> cost of monitoring losses and settling claims. Crop and livestock insurance use some indices that could be either yield, rainfall or even vegetation cover, and farmers receive payments when an index exceeds a certain predetermined loss threshold.

However, while the idea of index-based agricultural insurance is conceptually appealing to researchers and policy makers, the rarity of success stories where the initiative has sustainably worked for smallholder farmers in developing countries has been the norm rather than exception. The increasing frequency and severity of droughts in Africa is likely to make such initiatives unattractive to investors. Farmers who suffer significant losses but whose levels are below the set threshold are likely to lose trust in such schemes. This option therefore might not be for the vulnerable poor smallholder farmers especially those involved in staple crops production (Binswanger-Mkhize, 2012; Brick & Visser, 2015; Smith, 2016).

Considering lack of proper climate risk financing for smallholder agriculture in the context of uncertainty due to climate variability, farmers have used other self-insuring mechanisms such as

---

<sup>1</sup> Some of the transactions cost in agricultural setting would involve collection of household-level actuarial data for the purpose of risk classification and claim validation.

income diversification into non-farm enterprises, as well as, investment in adaptive technologies, assets and social networks (Binswanger-Mkhize, 2012; Elum, Modise, & Marr, 2017). Migration, the subject of this paper, is another strategy that households has always used to respond to environmental disasters. Communities in the semi-arid lands of Africa and Asia have for decades used internal and seasonal migration to survive droughts (Laczko & Sheean, 2010). However, this option is becoming increasingly unviable due to increased population pressure, climate change and resource conflicts (McCabe, Smith, Leslie, & Telligman, 2014).

To address some of the gaps identified above, this paper seeks to answer three key research questions in the context of Namibia. First, do migrants have better welfare outcomes compared to households with no migrants? Secondly, does the impact of migration on consumption expenditure differ for short-term frequent monthly spending and less frequent annual spending? Lastly, what is the impact of migration on uptake of adaptive strategies by rural families?

The rest of the paper is organized as follows. Section 2 presents a brief literature review with focus on migration as a livelihood diversification strategy and as an enabler of improved agricultural productivity and enhanced climate change adaptation. Section three discussing the conceptual framework outlining the impact pathway of migration on key outcomes. The section also presents the empirical strategy and sampling. Section 4 presents the data description and descriptive analysis. The section gives summary statistics of the migrants, characterizes the migration process and compares the migrant and non-migrant households on observables. Section 5 presents the empirical results and section 6 concludes with synthesis of the results and recommendations.

## **1.2. Literature review**

### **1.2.1. Overview of migration in Namibia**

Studies on migration in Namibia are few and data on migration is hard to find. The international Organization for Migration (IOM), and government of Namibia released the country's first migration profile in 2015 (Olivier, 2016). The 2011 national census show that the urban population has increased tremendously to 43% from 33% in the last decade and the rural population has shrunk by about ten percentage points (NSA, 2011). Many of the studies related to migration focus on urban poverty, housing, unemployment and food insecurity in Windhoek city, the main migration destination (Frayne, 2004; Karuaihe & Wandschneider, 2018; Pendleton, Crush, & Nickanor, 2014). The other important destinations for migrants include Oshakati in central North,

Swakopmund and Walvis Bay in the Western coast and Rundu. There is little information on the characteristics of the migrants, motivation and characterization of the migration process.

There were strict limitations on movement of people during the colonial period and apartheid era in Namibia and the majority of the black people were confined to demarcated reserves in the countryside and within certain areas of the big cities like the black township in Katutura (Niikondo, 2010). These restrictions were legislated and implemented through influx control and pass laws. The people that could move from rural areas to towns were mainly men brought to work in factories. These men lived in single-squatter houses and were by law not allowed to bring their families. The influx rule was abolished in 1977 following the end of apartheid legislation triggering rural-urban migration, rapid urbanization and expansion of the informal settlement (Seckelmann, 1997). Over two thirds of migrants to the city of Windhoek live in squatter camps mainly made of corrugated iron sheets and not serviced by municipal council (Niikondo, 2010).

Despite Namibia classification as an upper middle income country, urban poverty is pervasive in Windhoek coupled with high rates of unemployment and most residents reside in informal settlement with poor access to municipal services (Frayne, 2004). Rural-urban linkages are key survival strategy for migrants in urban areas and transfers in both ways. Food transfers from rural areas is the most common and households without rural linkages are more vulnerable (Frayne, 2004; Karuaihe & Wandschneider, 2018; Pendleton et al., 2014). Migrant use these linkages between urban and rural economies to overcome challenges associated with scarce employment opportunities in the urban formal economy (Frayne, 2007). Life for the urban poor is sometimes more riskier and uncertain than one in the rural areas but the prospect of finding a better job keeps their hope alive and therefore they opt to stay than return (Niikondo, 2010).

### **1.2.2. Role of migration and livelihood diversification**

Migration is one of the livelihood diversification and adaptive strategies rural families could use to manage current socioeconomic and environment shocks while also improving their capacity to cope with future risks (Grace, Hertrich, Singare, & Husak, 2018; Tacoli, 2009). The role of diaspora contribution to social and economic development of the recipient developing countries has received much attention in the recent scholarly work on migration (R. H. Adams & Page, 2005; Giuliano & Ruiz-Arranz, 2009; Gupta, Pattillo, & Wagh, 2009; Nyamongo, Misati, Kipyegon, & Ndirangu, 2012; Siddique, Shehzadi, Manzoor, & Majeed, 2016a, 2016b; Zezza, Carletto, Davis,

& Winters, 2011). In Africa for example, remittances increased by four fold between the period 1990 – 2010 and surpassed official development aid (Ratha et al., 2011).

However, related mobility costs might prevent rural poor households to benefit from migration (Mendola, 2008). Although many studies show international migration to have a positive impact on poverty reduction and better quality of life, the poor has mostly been seen to engage in low–return internal migration due to high mobility and entry costs (R. Adams et al., 2008; Mendola, 2008; Wouterse, 2012). In their study on effect of migration on income diversification in rural Burkina Faso, Wouterse and Taylor (2008) show that the destination of the migrant and the economic activity they engage are also key determinants of migration impacts. Therefore, even with domestic migration, migrant skills, social networks and economic opportunities to apply the acquired skills are important determinants of migration outcome. This in a sense creates a differential impact of migration across different social groups.

The impact of migration through remittances on wellbeing of receiving rural families differ spatially as well as contextually. For instance, studies show a positive impact of migration in reduction of stunting among in children due to improved nutrition in Guatemala, Tajikistan and El Salvador (Azzarri & Zezza, 2011; Carletto, Covarrubias, & Maluccio, 2011; De Brauw, 2011). There is also evidence that migration can reduce household vulnerability to shocks related to sharp increases in food prices and smoothen consumption in such periods. Mergo (2016), finds that migration also increases consumption expenditure among migrant households in Ethiopia although male migrants have higher impact than their female counterparts do in improving their families' wellbeing. Migration affects household consumption through reduced numbers of people left in the household, change in labour productivity and remittances. In Namibia, the energetic family members in many households move leaving behind pre-schoolers and elderly (Greiner, 2011). The income effect from remittances increase access to food and health by the receiving household (Zezza et al., 2011). It can also influence household's consumption and production practices through information flow (Karamba, Quiñones, & Winters, 2011).

Some studies have also found migration to have a neutral or negative impact to household wellbeing. For instance, Wouterse and Taylor (2008) find no evidence of any significant impact of migration on crop and livestock production in Burkina Faso. In Ghana, Karamba et al. (2011) did not find significant impact of migration on food expenditure but it does seem to shift consumption patterns to less nutritious foods like sugar and beverages among the migrant

households. While migration was associated with lifting about 40% of households above the vulnerability threshold in Kosovo, it had little significance on the extremely poor (Möllers & Meyer, 2014).

The current study will evaluate whether migration has any significant impact on wellbeing outcomes of rural households living in arid and semi-arid regions of Northern Namibia. The outcome indicators include household dietary diversity scores, months of inadequate household food provisioning and consumption expenditure. Consumption expenditure outcomes comprise of frequent expenditure like food and regular bills and less frequent expenditure like school fees, health and investment in improved technologies. Our hypothesis is that migrant households have better wellbeing outcomes than their non-migrant counterparts. However, if push factors are the main drivers of migration such that poor households sends more unskilled migrants from the home, then migration is likely to have no significant impact on selected key outcomes.

### **1.2.3. Migration and climate change adaptation**

This relationship between migration and climate change has not received much attention in standard theories of migration (Black, Adger, et al., 2011). The traditional view of migration in relation to deteriorating environmental conditions such as devastating droughts, famine and flooding has been that of the last resort following failure of local adaptation strategies often characterised as displacement of families (Black, Adger, et al., 2011; Wang, Brown, & Agrawal, 2013). Such migrants are loosely referred to as environmental refugees (Myers, 2005). Environmental change can either affect migration directly through displacement or indirectly through socioeconomic factors such as resource competition and conflicts (Black, Adger, et al., 2011).

An example of adaptive migration is the famous “dusk bowl migration” where thousands of Americans moved to California and Coastal pacific states following prolonged drought and economic recession of 1930s (James N Gregory, 1989; James Noble Gregory, 1991; R. McLeman, 2006; Oakies, 1989). Mobility therefore becomes an important adaptive response to climate risks when communities reach certain thresholds of climate change impacts on natural resource and environment (Adamo, 2008; Bardsley & Hugo, 2010).

Other scholars view migration as a smart proactive diversification strategy of dealing with future threats to livelihoods due to climate change risk (Boano & Morris, 2008; Dessai et al., 2004; Kniveton, Schmidt-Verkerk, Smith, & Black, 2008a, 2008b; R. A. McLeman & Hunter, 2010).

The common thesis of these studies is that of climate change driving migration patterns. Climate-induced migration is expected to increase in scale and scope and much of it will be in developing countries (Rechkemmer et al., 2016; Webber & Barnett, 2010). Households facing uncertainty about weather are more likely to use migration as an ex-ante adaptive strategy (Alem, Maurel, & Millock, 2018; Barrios, Bertinelli, & Strobl, 2006). Climate factors such as water scarcity and rainfall variability have been singled out as main drivers of supply push type of migration from rural to urban areas (Marchiori, Maystadt, & Schumacher, 2012; Menon, 2009). However, it is noble to highlight that migration is a complex issue and attributing it to climate change can be problematic (Bardsley & Hugo, 2010). There are many drivers of migration that range from environmental, socioeconomic and behavioural hence it is highly unlikely that climate change would be the sole motivation to migration (Black, Adger, et al., 2011; Black et al., 2008; Castles, 2002; Kniveton et al., 2008b). Indeed this study will not attempt to establish this causal link between migration and climate change but rather focus on how key outcomes for communities vulnerable to negative climate change impacts differ by household's migration status while controlling for key drivers of migration.

#### **1.2.4. Effect of Migration on agricultural productivity and adaptive capacity**

Scholars are now shifting research focus to looking at the role of migration in diversifying the traditional agrarian-based livelihoods, spreading risk and increasing resilience of migrant rural families in the context of climate change (Laczko & Sheean, 2010; Tacoli, 2011). Recent studies have looked at the extent to which remittances received by migrant households relax liquidity constraints and enhance uptake of high-cost adaptive strategies and technologies (Karanja Ng'ang'a, Bulte, Giller, McIntire, & Rufino, 2016; Nguyen, Raabe, & Grote, 2015).

Although in principle, migration through remittances can play an important role in uptake of adaptive technologies by rural agrarian families, few empirical studies exist on this subject and findings are largely inconclusive. For instance, Taylor and Lopez-Feldman (2010) find evidence using household survey data in Mexico that migration raised land productivity and per capita income. However, a study in El Salvador found no effect of migration on agricultural input use and was instead associated with reduced land and labour productivity because farming by migrant households was less intense than in non-migrant households (Damon, 2010). In the Philippines, migration was found to have no impact on relaxing credit constraints (Quisumbing & McNiven, 2010). In Kenya and Vietnam, migration increased the likelihood of investing in high cost adaptive technologies and was found to compliment other local adaptation strategies (Karanja Ng'ang'a et

al., 2016; Nguyen et al., 2015). Similar results were obtained in Bangladesh where households engaging in international migration were found to have higher chances of investing in modern agricultural technologies (Mendola, 2008).

Lucrative international migration is expensive and poor households may not raise enough resources to cover mobility and entry cost. Those most vulnerable to climate change impacts are the poor (Black, Bennett, Thomas, & Beddington, 2011). Migrants from such backgrounds might also be lacking in education and skills further alienating them from employment and economic opportunities at the target local destinations. (Greiner, 2011) reckon that unlike well off families who use migration to move up social ladder, poor migrant-households are caught up in subsistence trap, which negatively affects the migrants' capacity in such networks to save or invest. It is interesting to establish whether households that receive remittances in the wider semiarid Northern Namibia use it for consumption smoothing or investment in long-term adaptive strategies.

The current paper will evaluate the impact of migration on uptake of adaptive technologies. Our hypothesis is that poor households engage in low return type of migration and remittances received from migrants do not meet the threshold for investment in adaptation technologies. Our second proposition is that much of the remittances received are used for consumption rather than investing in long-term adaptive technologies.

### **1.3. Methodology**

#### **1.3.1. Theory of change and impact pathway of migration**

We conceptualize migration not just a household's strategy to cope with short-term socioeconomic shocks but also an enabler of long-term investment in other adaptive strategies hence building resilience against climate risks (Figure 3-1). Rural-urban migration in Namibia is driven not just by the neoclassical theory of wage differentials between rural and urban areas but also by perceived spatial opportunities in the urban areas. Under the current framework, households facing climate variability challenges send migrants to either pursue education or look for work to diversify family income.

Households' wealth status, social networks, skill set and demographic characteristics of the household leadership determine both migration process and outcome of migration. Richer households are more likely to have skilled human capital and can afford to send migrants to destinations that are more lucrative with high returns.

Poor households on the other hand are likely to send unskilled migrants to less lucrative migration destinations with low probability of finding work. The type of migration is an important factor as poor households may fail to overcome entry cost of high-return international migration and hence have little or no impact on uptake of adaptive technologies and wellbeing outcomes of the household. Wealth status could also indicate households' capacity for self-employment or to generate labour demand in the rural setting, which might negatively affect the propensity among the unskilled potential migrants to migrate.

In keeping with neoclassical theory of migration (Lee, 1966), push factors at the rural village like high rural poverty levels, mismatch of opportunities with acquired skills, poor infrastructure, adverse climate, small farms and high-income variability are other determinants of migration. Contrary to Stark and Bloom (1985) new economics of labour migration theory that assumes a joint migration decision at the household level, we posit that the decision to migrate in very poor families especially among unmarried youth is more likely to be individual. However, the decision to migrate is highly likely to be coordinated and collective at household level where mobility costs are high and when the motive is to pursue education. The pull factors at the migration destination include perceived better opportunities than in the place of origin, existing social networks and kinship ties, better amenities and higher wages. There exists evidence that large pools of earlier migrants from the same place of origin facilitate future migration from the same area (R. Adams et al., 2008).

Migrant characteristics are also drivers of both migration and migration outcomes. An educated migrant with high social networks and nonfarm skills is more likely to migrate (Lanzona, 1998), and get employment at the destination compared to unskilled, less educated migrants. Young people with high aspiration for better life are more likely to migrate compared to less ambitious and older people. Likewise, married women are less likely to migrate compared to single women. Young men are generally more likely to migrate than females partly because of the job structures in urban areas and males are less vulnerable to risks related to the migration process (Lall, Selod, & Shalizi, 2006). These could constitute endogenous push factors of migration process or what Lee (1966) referred to as personal factors.

Policies aimed at improvement of communication and transport infrastructure, rural electrification and market development may open up new opportunities for young people in the rural areas and reduce the likelihood of outmigration. Policies that support manufacturing, affordable housing and

security in urban areas will act as pull factors attracting potential migrants. Lack of policy planning may lead to unintended consequences of migration like development of slums and insecurity (Lall et al., 2006). For instance, formalized land tenure is a precondition for accessing municipal services in Windhoek yet the majority of the city dwellers living in informal settlements do not own land under existing land policy (Karuaihe & Wandschneider, 2018).

The impact pathways through which migrants can influence household welfare outcomes and climate change adaptation are remittances, information flow and technology transfer. The amount of remittances received by household is thought to be a function of the migrant-specific characteristics like gender, age, marital status, education, professional training as well as other factors such as destination, industry of work, duration of migration, social networks and type of migration.

The household can then use resources and information received from migrants to cope with short-term socioeconomic shocks like food insecurity, health and community contributions. They can also invest directly in long-term adaptation strategies like stress tolerant crops, water harvesting and management, improving human capital through education and training as well as, investing in nonfarm businesses. Households can also use income earned from businesses to enhance their adaptive capacity further.

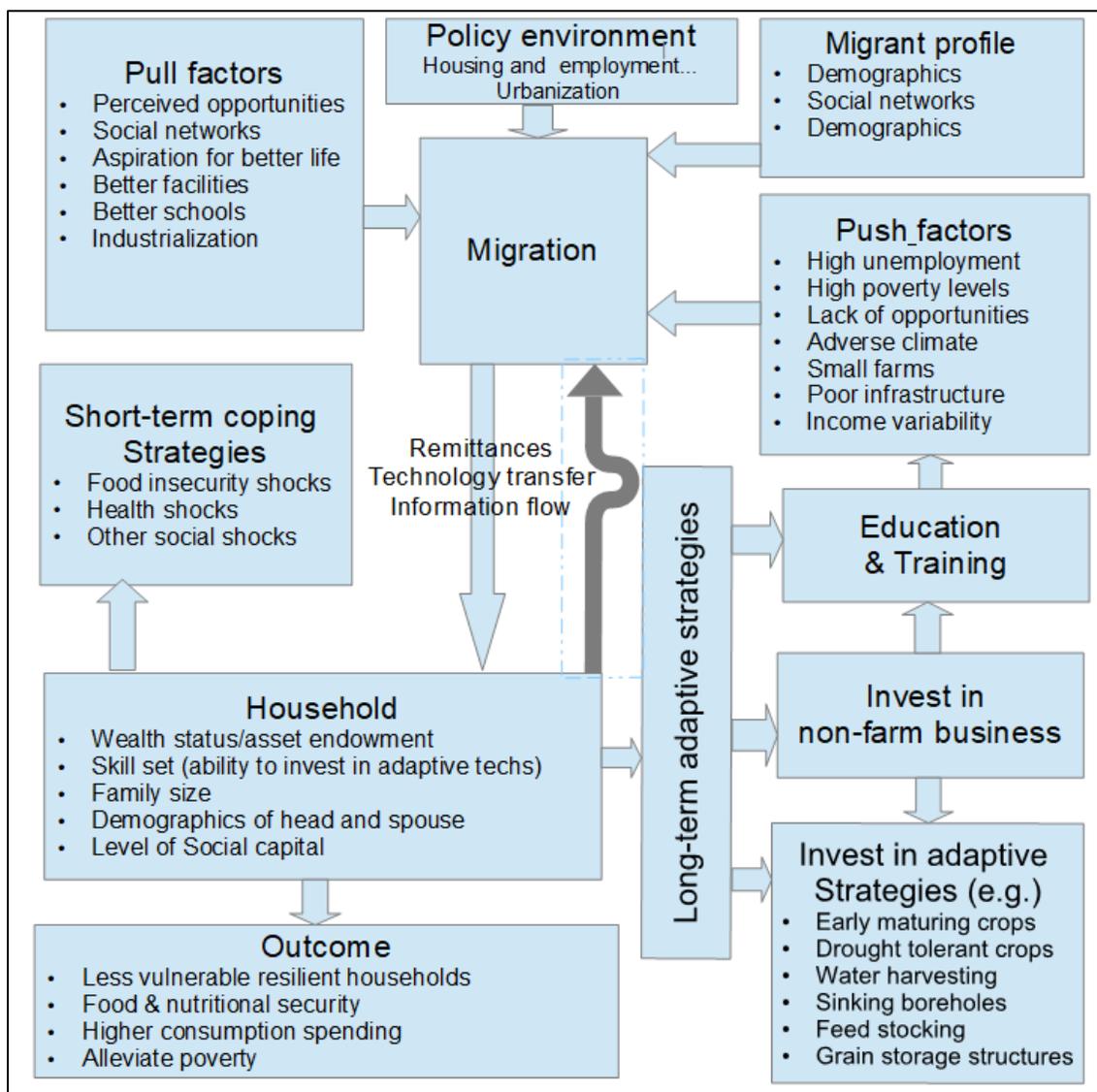


Figure 1-1 Conceptual model of Impact pathway of migration (source: author)

### 1.3.2. Analytical framework (Empirical model of impact evaluation)

One of the major challenges in evaluating causal impacts of migration using cross sectional survey data is the perverse endogeneity and lack of appropriate exogenous instruments that are correlated with migration decisions but uncorrelated with the errors in the outcome equation. Most of the push factors driving an individual's decision to migrate are also likely to affect outcome variables of interest at the household level. The challenge is that an instrument that works for one circumstance might not work in another context.

The missing data problem or lack of credible counterfactual can be resolved by employing experimental methods to migration studies (McKenzie & Yang, 2010). However, such experiments are usually very expensive because they might involve tracking the migrants to their destinations and tracing their families back in the rural home villages and countries in the case of international migration. For observational studies, Lewbel (2012) proposes using error heteroscedasticity to construct instruments using available exogenous covariates to identify and estimate endogenous regressors. He later demonstrates that the assumptions required for identification are also applicable when the endogenous covariate is binary (Lewbel, 2018). Here we present these assumptions and application in the context of migration as an endogenous regressor. The model can be presented as

$$Y_i = \mathbf{X}'\beta_1 + M_i\gamma + U \alpha_1 + v_1 \quad (1)$$

$$M_i = \mathbf{X}'\beta_2 + U \alpha_2 + v_2 \quad (2)$$

Where  $Y_i$  is the outcome variable of interest (*consumption expenditure, food security and adaptive capacity in present case*) for household  $i$ ,  $\mathbf{X}$  a vector of exogenous covariates,  $M$  is the endogenous migration variable and  $\beta_1$ ,  $\beta_2$  and  $\gamma$  are parameter vectors.  $U$  is a common unobserved or omitted variable that directly determines both the migration decision and outcomes of interest.  $V_1$  and  $V_2$  are uncorrelated with exogenous variables and independent of each other. Let  $\varepsilon_1 = \alpha_1 U + V_1$  and  $\varepsilon_2 = \alpha_2 U + V_2$ . Key assumptions for identification of the reduced form are  $E(\varepsilon_1 X) = 0$  and  $E(\varepsilon_2 X) = 0$ . For structural model identification, one would make strong assumptions that at least some of the elements of  $\beta_1$  are equal to zero for the standard instrument variable estimation to be consistent. In absence of identifying restrictions and heteroscedasticity of  $\varepsilon_2$ , Lewbel (2012) suggests restricting  $Cov(X, \varepsilon_2^2) \neq 0$  and  $Cov(Z, \varepsilon_1 \varepsilon_2) = 0$  to identify the structural equation.  $Z \in \mathbf{X}$ , represents generated valid instruments for migration that are constructed from the mean-

centered exogenous covariates and the vector of residuals,  $\boldsymbol{\varepsilon} = (\varepsilon_1, \varepsilon_2)$ , from the auxiliary first stage regression.

$$Z = (X_j - \bar{X}) * \boldsymbol{\varepsilon} \quad (3)$$

Since  $Z$  is a subset of the  $\mathbf{X}$  vector, no additional information outside of the model is required. The key assumptions are that  $\varepsilon_1$  and  $\varepsilon_2$  are independent ( $\varepsilon_1 \perp \varepsilon_2 | Z$ ) and  $E(\varepsilon_1) = 0$ . These two assumptions ensures that the key identifying assumption  $Cov(Z, \varepsilon_1 \varepsilon_2) = 0$  holds.

Lewbel (2018) shows that one can achieve identification even when the orthogonality condition of the errors is violated. We implement the procedure in two steps. In the first step, we estimate  $\hat{\beta}_2$  using either logit or probit models by regressing the endogenous migration dummy on exogenous covariates  $\mathbf{X}$ . The goal is to obtain the residuals  $\hat{\varepsilon}_2$  i.e.

$$\hat{\varepsilon}_2 = M_i - X' \hat{\beta}_2$$

In the second step, we estimate  $\hat{\beta}_1$ , and  $\gamma$  by linear 2SLS regression of  $Y_1$  on endogenous  $M$  using  $\mathbf{X}$  and  $Z\hat{\varepsilon}_2$  as instruments. By construction  $E(Z) = 0$ . We use stata routine `ivreg2h` developed by Baum, Lewbel, Schaffer, and Talavera (2012) for estimation which provides three sets of estimates: the classical IV estimates that use excluded instruments, estimates using only the generated instruments and one that uses both the excluded instruments and generated instruments. In the results section we compare the results obtained using the constructed instruments to those obtained using both the excluded instruments and generated instruments.

We use as excluded instruments the number of extended family members (not household members) employed outside the region of residence for more than 5 years. We believe these already established kinship ties are an important source of information and could offer temporary support systems to migrants but are less likely to affect outcomes of interest. Karanja Ng'ang'a et al. (2016) used this instrument in their study on migration and self-protection against climate change among Kenya's pastoral communities. The second excluded instrument is the degree of social networks as measured by the number of informal networks, community organizations or clubs. These could be crucial in mobilizing resources need to cover migration cost. Although the second instrument pass the first stage, the exclusion restriction is likely to be violated and therefore we use the two instruments together with the constructed instruments in our estimation. All the instruments pass the Hansen's J validity test with high  $P$ -values.

### 1.3.3. Sampling

The study used primary survey data collected from a representative sample of 600 rural households in arid regions of Northern Namibia. We used a multistage sampling procedure to generate a self-weighted probabilistic sample. The study covered seven constituencies in three administrative regions namely Omusati, Oshana and Oshikoto (Figure 3-2). The constituencies are Onesi, Oshikuku and Otamanzi in Omusati region; Okaku and Ongwediva in Oshana region and Olukonda and Omuthiya in Oshikoto region.

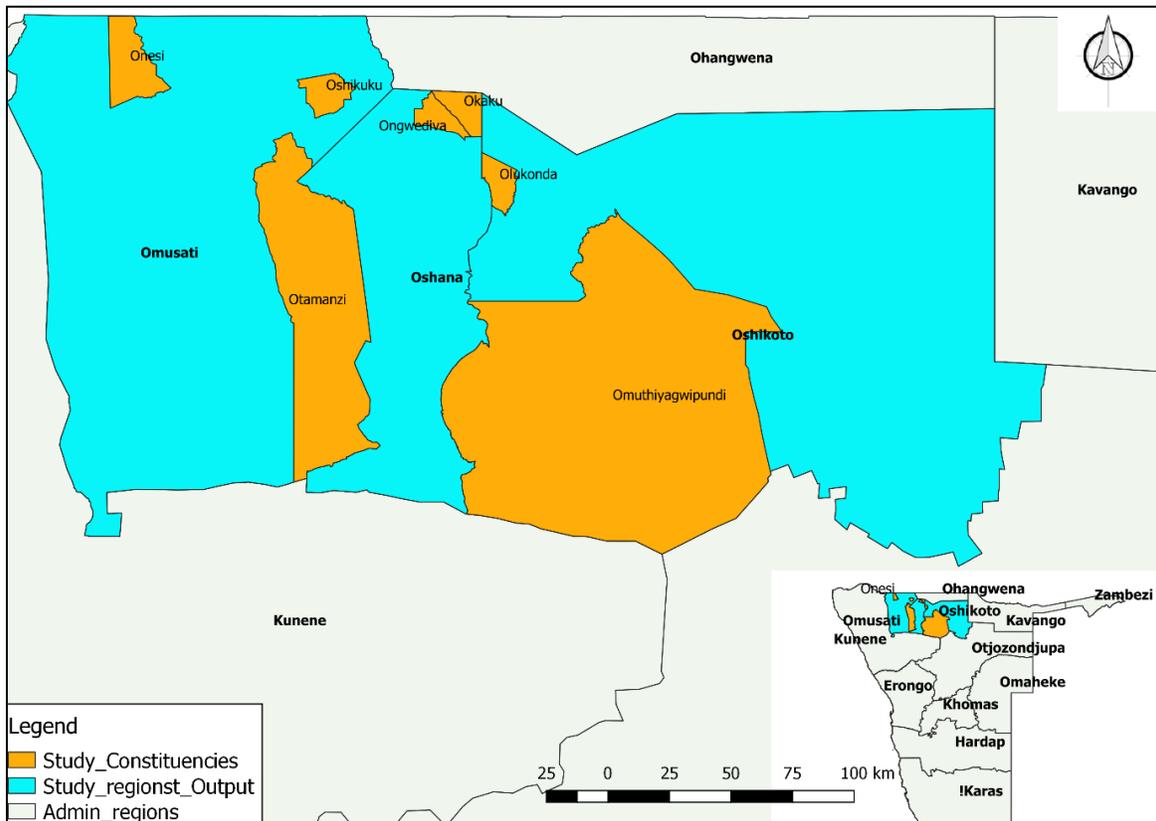


Figure 1-2: Study area map showing regions and constituencies covered (source: author)

We started field research by a prior visit to all the three selected study regions to generate sampling frames and piloting of the survey tool with the local people. The first step was at the selected constituency offices where we listed all the villages in each of the constituency. We then randomly selected the number of villages required for each constituency using probability proportionate to size sampling (PPS). The second step involved visiting the selected villages and listing all the households in each of them with the help of the village headmen or elders. The third step involved randomly selecting 10 households from each of the villages with an additional five for possible replacement. We carried this exercise in May 2017 and used the lessons learnt to prepare for survey logistics and revise the survey instrument. Two trained teams each comprising of five enumerators

and a supervisor collected the data from 653 households using Computer-Assisted Personal Interviewing (CAPI) between July and September 2017.

#### **1.4. Data description and descriptive analysis**

The following section presents a brief description and gender disaggregated summary statistics of the key demographic, social and economic characteristics of migrants. The section also characterizes migration processes to shed light on the motivation and the reasons for migration as well as target destinations. The last part of descriptive analysis compares the migrant and non-migrant households to check if they are statistically different on observable social, economic and institutional characteristics.

##### **1.4.1. Gender differentiated migrant characteristics**

**Age:** Most migrants were young with an average age of 32 years. Female migrants are slightly younger (30 years) than their male counterparts by three years (Table 3-1).

**Education:** The average education of migrants in our sample was grade 10 implying that most migrants had completed junior secondary<sup>2</sup> school. More female migrants than their male counterparts completed both junior and senior secondary school (Figure 3-3). Over a third of those who completed grade 10 did not proceed to grade 12, an entry requirement for enrolment in tertiary institutions. This translated to low transition rates (21.2%) to tertiary institutions of learning. These results almost mirror the World Bank's statistics of 20.69% enrollment at tertiary level. The data shows that more females than males enroll in tertiary education and the gap has been widening since 2008 (Figure 3-4). Transition to university education was very low among migrants with 13% enrolling for bachelors and only two percent for postgraduate degrees (Table 3-1).

Migrants who drop out of school after primary schooling level and those that do not complete secondary schooling can acquire necessary skills through vocational training. However, the data suggests low access to technical and vocational education and training (TVET) colleges. Only about six percent of migrants had attended these colleges. In their paper on income mobility and poverty dynamics, Woolard and Klasen (2005) observe that lack of education keeps families in poverty traps. Formal education and nonfarm experience are likely to be rewarded more in the nonfarm sector (Junge, Revilla Diez, & Schätzl, 2015).

---

<sup>2</sup> After successful completion of grade 10 exam, the students receive junior secondary certificate. Those who proceed write a final Cambridge moderated exam in grade12 and receive senior secondary certificate that allows them to get admission in tertiary education institutions.

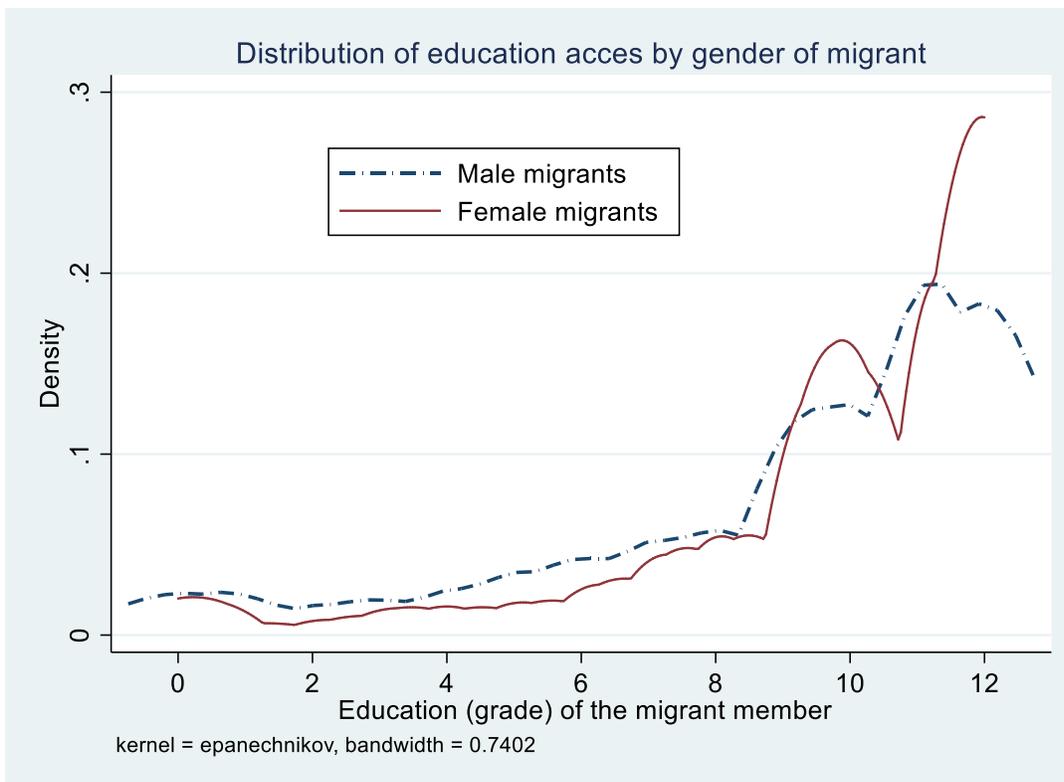


Figure 1-3: Distribution of Education by gender of migrant members

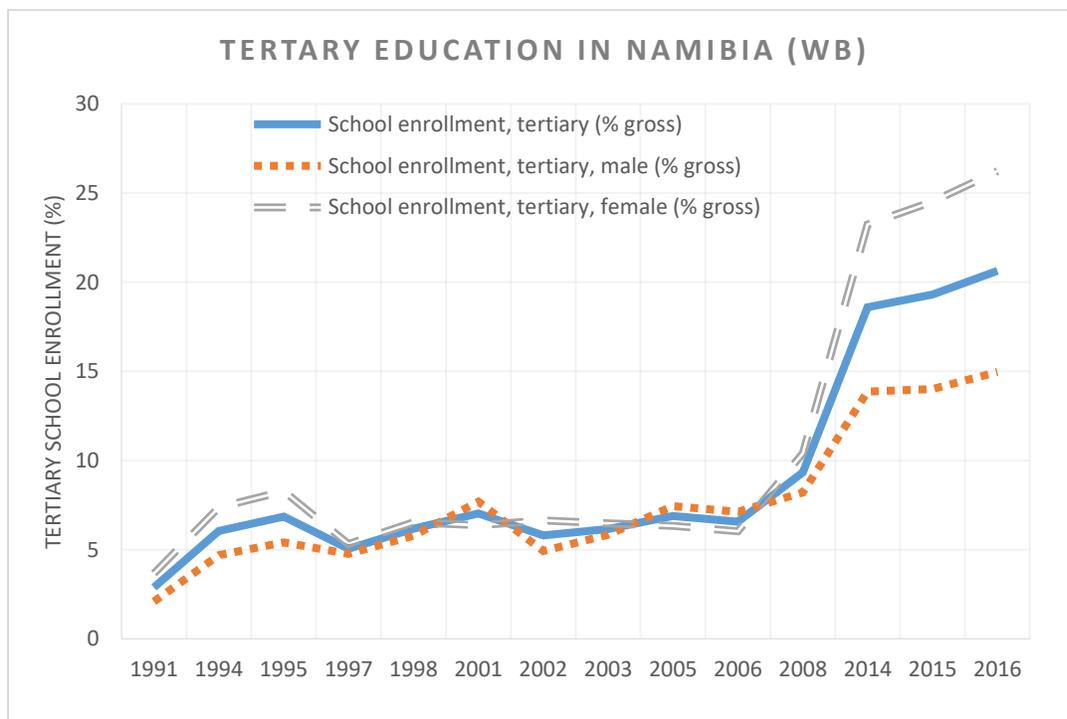


Figure 1-4: Tertiary education enrolment by gender (source: by author using WB open data)<sup>3</sup>

<sup>3</sup> Ratio of total enrolment at tertiary level to the population of those that successfully completed secondary education. <https://data.worldbank.org/>. WB Total tertiary enrolment was 21% and our results is 21.16%.

*Professional Training:* Over two thirds of the migrants had no post school skills training and majority were females. The proportion of female migrant without training was 72% while that of males was 64%. The most common form of training for migrants was police or army (7.7%) and many of them were males. More female migrants than males engaged in professional training like teaching, nursing and accountancy. Male migrants on the other hand trained in by mechanic and welding, carpentry, mason and plumbing and driving. Very few migrants had training in medicine, law or engineering.

*Marital status:* Only a fifth of migrants were married and mostly in monogamous relationship. Less than two percent were either divorced, separated or widowed.

*Relation to the head:* Most of the migrants are children or grandchildren of the household heads. Household heads comprise only five percent of migrants and most of them were males.

*Occupation:* Slightly more than a third of the migrants got some salaried jobs like domestic work, teaching, police and army, security guards and drivers. More female migrants (36.64%) were in salaried employment than their male counterparts (34.5%). However, a quarter of the migrants had no employment and many of them were females. There were more female student migrants (18%) than there were male student migrants (12.64%). While more females than males were self-employed in informal business, many male than females engaged themselves as artisans and wage labor.

Table 1-1: Demographic and economics characteristics of migrants

		Female n=554)	Male (n=609)	All (n=1,163 )
Demographic characteristics	Age (years)	30	33	32
	education (Grade)	10	9	10
	Vocational training (%)	5.05	6.57	5.85
	Tertiary-certificate (%)	3.43	1.97	2.67
	Tertiary-diploma (%)	3.97	2.63	3.27
	Tertiary –Bachelor’s degree (%)	15.88	10.67	13.16
	Tertiary (post graduate) (%)	2.35	1.81	2.06
Marital status of the migrant	Married (monogamous) (%)	16.06	17.41	16.77
	Single (%)	81.95	81.28	81.6
	Divorced/windowed (%)	1.98	1.31	1.64
Relation to <i>the</i> head (%)	Household head	2.16	7.88	5.16
	Spouse	1.62	0.82	1.2
	Child	58.3	53.04	55.55
	Grandchild	22.92	25.29	24.16
	Sister/brother	5.96	5.75	5.85
	other relatives	8.12	6.4	7.22
	Unrelated friend	0.9	0.82	0.86
Training	No Professional training	71.7	64.4	67.8
	Police/army	5.2	9.9	7.7
	Teacher	6.1	3.4	4.7
	Mechanic/ Welder	0.9	6.9	4.0
	Carpenter/ plumber/ Mason	1.8	4.9	3.5
	Accountant	4.0	2.0	2.9
	Nurse	4.9	0.5	2.6
	Driver	0.0	4.6	2.4
	Engineer	1.1	2.3	1.7
	Hair dresser/barber	1.6	0.2	0.9
	Tailor	1.6	0.0	0.8
	Doctor	0.9	0.5	0.7
	Lawyer	0.2	0.5	0.3
Occupation	salaried employment	36.64	34.49	36.54
	Not working	26.35	22.99	24.59
	Student	18.05	12.64	15.22
	Informal business	10.65	6.24	8.34
	Artisan (carpenter, plumber, welder)	2.17	9.36	5.93
	Wage labour	1.62	8.05	3.71
	Registered formal business	1.62	3.94	2.84
	Agriculture (farmer)	1.99	1.31	1.89
	other specify	0.91	0.98	0.94

#### **1.4.2. Migration characterization**

*Motivation to migrate:* Push factors seem to dominate peoples' motivation to migrate from their rural homes. The main motivation for 44% of the migrants was to seek better life and better opportunities (36%). Slightly more male migrants (46%) than female migrants (42%) moved to seek better life. More females (12%) than males (10%) however moved because of the better schools in the target destination. Motivation to migrate for six percent of female and four percent of male migrants came from relatives. Although few cited drought as the push factor in migration decision, one can link unfavorable climate to lack of economic opportunities in the rural areas. The harsh climate is a common trigger of internal migration as an adaptation strategy among the youth (R. A. McLeman & Hunter, 2010).

*Reason for migration:* Search for employment was the main reason of migration for 36% of females and 42 % of males. More females than male migrants migrated to acquire education. The proportion of female and male migrants who migrated because they got a job was 28% and 33% respectively. Very few migrants moved to start a business or because they got married (Table 2).

*Facilitation:* Almost three quarter of migrants moved on their own suggesting that the decision to migrate is not always collective at the household level. Results suggest that kinship rather than social networks is more important determinant of migration. Only about one percent migrated through friends and neighbors.

*Duration in the destination:* The average duration of stay in the destination is between 1 to 5 years for 45% and 40% of female and male migrants respectively. Slightly less than a fifth of the migrants had stayed in the migration destination for between five and ten years. Slightly more than a tenth had staying at their destination for over ten years

*Remittances:* The proportion of migrants who sent remittances their families back in the rural areas was 38.6% (Table2). The proportion of men sending remittances was slightly more (39.4%) than that of female migrants (37%). The average amount of remittances received by migrant households annually was N\$ 4672.88. The average amount male migrants remitted was N\$4755.48 compare to N\$4575.21 sent by female migrants. Subsection 5.1 will present an empirical analysis of key determinants of amount of remittances received by migrant households with special emphasis on the role of education and training.

Table 1-2: Gender disaggregated characterization of migration process

		Female (n=554)	Male (n=609)	All (n=1163)
Motivation	Seek better life	42.4	46.0	44.4
	No opportunities in the village	34.8	36.5	35.7
	Better schools	12.3	9.9	11.0
	Invited by relatives/	6.1	3.9	5.0
	Droughts	1.3	2.3	1.8
	Marriage	2.5	1.1	1.7
	Moved permanently	0.5	0.3	0.4
Reason for moving	Look for employment	35.7	42.4	39.2
	Got a job	28.3	33.2	30.9
	Acquire education	25.8	17.4	21.4
	Start own business	2.9	2.3	2.6
	To join parents	2.9	2.1	2.5
	Married	2.5	1.1	1.7
	other reasons	1.8	1.5	1.7
Migrated through	Own (n=854)	69.3	77.2	73.4
	Relative/ family (n=290)	28.9	21.3	24.9
	Friend/Neighbour (n=11)	1.3	0.7	0.9
	Contractor/Agent (n=1)	0.2	0.0	0.6
	Government support (n=7)	0.4	0.8	0.1
Duration	<6 months	9	9	9
	6months-1 year	18	19	18
	1-5 years	45	40	42
	5-10years	16	18	17
	>10 years	12	14	13
Remittances	Remittances	37.0	39.41	38.26
	Amount of remittances (NAD)	4575.21	4755.48	4672.88

#### 1.4.3. Destination and form of migration

Figure 3-5 shows the most common migration destinations in Namibia. The city of Windhoek was the choice destination for 43% of migrants. Walvis Bay was the second most popular destination city for nine percent of migrants followed by Oshakati (6.8%), Ondangwa (5.5%), Swakopmund (4%) and Ongwediva (3.4%). It is clear from the figure that the main form of migration is internal rural-urban. International destination accounted for only one percent of rural outmigration in our sample. Past study in Southern Africa region covering seven countries including Namibia have shown that compared to internal rural-urban migration, households with international migrants were more likely to receive remittances both in kind and cash (Crush & Caesar, 2017).

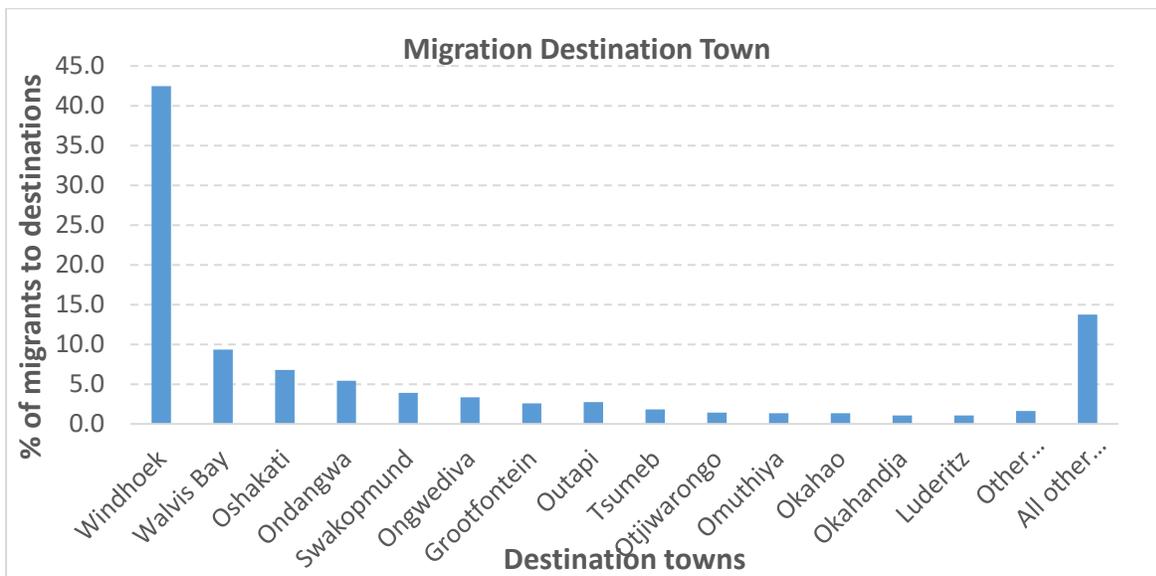


Figure 1-5: Migrants' destination towns

#### 1.4.4. Summary statistics by household's migration status

This section gives a comparative descriptive analysis of key variables between the migrant and non-migrant households. Migrant households comprise 61% of the 653 households in our survey and two thirds had more than one migrant. However, only about half the migrant households received remittances albeit irregularly. Results show that migrant and non-migrant households were similar in many individual, household and social characteristics (Table 3-3). The average age of the household head was 61 years and did not differ significantly by migration status of the households. Past studies show that youthful Namibians usually migrate to towns and cities leaving behind preschoolers and elderly in the rural villages (Greiner, 2011).

The two groups had about the same level of household head education of 5.6 years and average household size of about six persons. The average farm size was 6.5 hectares and did not differ significantly between the two groups. The average cultivated land was 3.6 ha, about half of the farm size. At least three quarters of the households received government drought relief and the difference by households' migration status was not significant. The two groups had about the same level of livestock assets although the migrant households had slightly higher assets endowment than their counterparts. On average, the households had two adult members contributing to household's income. Farm income from both crop and livestock was about the same between the two groups of households but migrant household's nonfarm income was N\$7400 higher than that of non-migrant households. Pension income did not differ significantly by household's migration status also.

The two groups were similar in terms of access to social networks. These include membership to social groups, number of social groups they belong to, number of friends and other households that a family could ask for help in time of need. Looking at the outcome variables, the migrant households seem to be better off compared to non-migrant households.

Migrant households had significantly higher annual income by about N\$ 3900, monthly income by approximately N\$200 and food spending by about N\$70. The results also suggest that the migrant households are slightly better off in terms of food security. However, looking at the distribution of key outcomes, we see that the non-migrant households have significantly higher annual consumption expenditure than migrant households (Figure 3-6). The two groups have similar distribution of household dietary diversity, monthly expenditure and food spending. However, at higher levels of expenditure over the N\$5000 mark, the migrant households spend slightly more than did the non-migrant households.

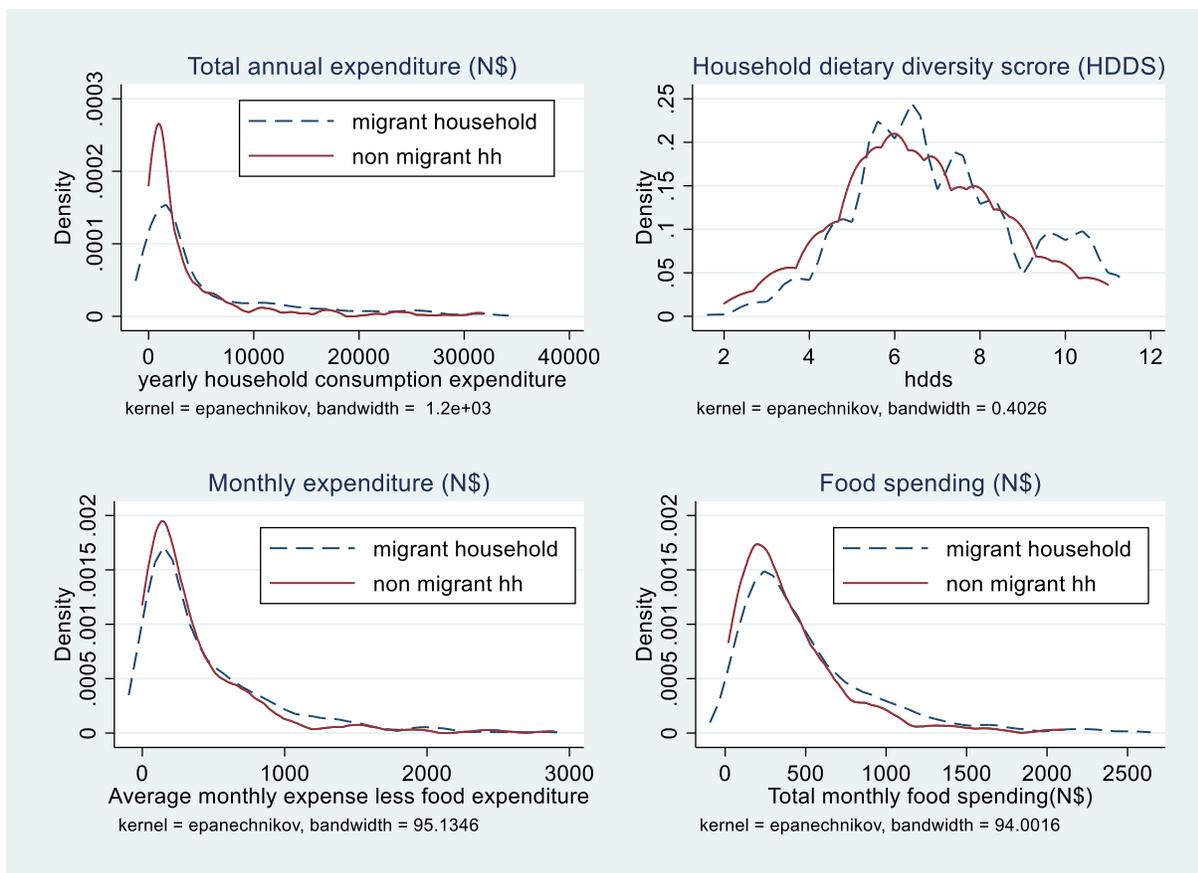


Figure 1-6: Distribution of key welfare outcomes by household's migration status

Table 1-3: Summary statistics by migration status

Variable	Control (n=253)		Treatment (n=400)		Whole sample (n=653)		statistical test difference	
	Mean	Std. Err.	Mean	Std. Err.	Mean	Std. Err.		
individual	Household head age (years)	60.70	1.05	62.20	0.85	61.62	0.66	-1.504
	Household head education	5.63	0.25	5.66	0.20	5.64	0.16	-0.0265
	Male head	0.48	0.03	0.40	0.02	0.43	0.02	0.083**
Household	Mobile money	0.19	0.02	0.27	0.02	0.24	0.02	-0.082**
	Household size	5.38	0.19	5.76	0.16	5.62	0.12	-0.379
	Farm size (ha)	6.34	0.27	6.66	0.23	6.54	0.18	-0.321
	Area under crop (acre)	3.61	0.15	3.57	0.10	3.58	0.08	0.0358
	Tropical livestock units (tlu)	4.90	0.62	6.16	0.64	5.67	0.46	-1.26
Income	Government drought relief	0.79	0.03	0.76	0.02	0.77	0.02	0.0395
	Adults contributing to household income	1.66	0.08	1.59	0.06	1.62	0.05	0.0676
	Off farm income (N\$)	7694.70	2342.48	15124.03	2360.62	12245.59	1711.94	-7429.30**
	Crop income (N\$)	1282.64	234.68	1267.69	250.37	1273.48	178.17	14.96
	Livestock income (N\$)	241.98	85.70	756.95	238.41	557.43	150.01	-515*
	Pension income (N\$)	8253.76	2080.26	9496.50	1443.80	9015.01	1195.83	-1242.7
social networks	networks	0.22	0.03	0.23	0.03	0.22	0.02	-0.00761
	group	0.16	0.02	0.16	0.02	0.16	0.01	0.00
	Number of friends	3.28	0.41	3.56	0.30	3.45	0.24	-0.28
	households financial help	1.44	0.10	1.63	0.10	1.55	0.07	-0.19
outcome	Yearly expense (N\$)	4773.99	829.98	8725.65	1235.01	7194.61	824.98	-3951.7**
	Monthly expense (N\$)	420.31	41.03	645.56	90.48	558.29	57.79	-225.20**
	Total food expenditure (N\$)	442.91	37.74	511.84	21.66	485.13	19.77	-68.93*
	Household dietary diversity index (dds)	6.69	0.12	7.08	0.10	6.93	0.08	-0.386**
	Months of inadequate food provisioning	1.43	0.15	1.47	0.12	1.45	0.10	-0.0302

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

## **1.5. Estimation Results and Discussion**

### **1.5.1. The role of education and training as drivers of remittances**

Education and training are key determinants of migration outcomes by increasing migrant's odds of finding a job in nonfarm sector. Since the most common impact-pathway of migration on household outcome is through remittances, we test the hypothesis that tertiary training and post school skills training have impact on remittances. To do this we use data of 1163 migrants in our sample. We employ a combination of exogenous and constructed instruments using Lewbel's approach to deal with self-selection, and omitted variable bias. Self-selection could arise because of other unobserved variables like innate ability of the migrant and their motivation to send remittances like altruism or self-interest.

We use household head education and training to instrument education of the migrant. This is because these instruments directly affect the education of the migrants but are likely to be uncorrelated with these unobserved factors (errors). Estimation using generated instruments and a combination of generated and exogenous instruments seem to perform better in reducing bias and the model is more efficient than the standard instrument. The instruments (both exogenous and generated) pass the Hansen J validity test (Table 3-4).

We find that the amount of remittances sent to recipient households did not vary by either age or gender of the migrant. However, remittances received by households varied by region. Remittances received by migrant households in Omusati region were higher by N\$ 929 in Oshana and N\$ 898 in Oshikoto.

Basic education in Namibia was free and compulsory up to grade 10 at the time of the survey. Results show that households that invested in educating their children at tertiary level of education received significantly higher benefits than those that did not. On average, a migrant with college or university training sent at least N\$1155 more compared to those that those that did not have tertiary level education.

Results provide evidence to support the importance of post school skills training in enhancing migration outcome. Migrants having skills training on average sent at least \$1230 more compared to those without any training. Equipping migrants with post school skills training increase the likelihood of either self-employment or finding job. Migrants whom had salaried employment on

average sent to their rural families N\$ 1725 more compared to those engaged in other activities like farming and wage labor. The self-employed migrants on average sent about half that amount.

Table 1-4: Drivers of the amount of remittances sent by migrants to rural families

VARIABLES	(1) Standard IV		(3) Generated Instruments		(5) Generated and Excluded Instruments	
	coef	se	coef	se	coef	se
High education (dummy)	-1,547.24	3,602.77	1,157.95**	508.43	1,155.83**	505.73
Post school skills trainings	3,082.09	2,784.12	1,232.93**	514.28	1,234.38**	515.27
Oshana region	-892.28*	469.87	-929.21*	496.86	-929.18*	496.81
Oshikoto region	-822.72**	363.83	-898.39**	410.20	-898.33**	410.11
Migrant age	15.12	13.29	12.06	14.00	12.07	14.00
Migrant sex (1=male;0=female)	57.20	345.19	-55.35	385.33	-55.27	385.21
Salaried employment (1=yes;0= no)	2,024.28***	708.37	1,725.34***	400.17	1,725.57***	400.44
Self-employed (1=yes;0= no)	1,358.96*	808.40	898.29***	309.93	898.65***	310.25
Relation to household head: (base category =head)						
Relation to head: child	-3,732.63***	930.93	-3,990.47***	810.58	-3,990.27***	810.70
Relation to head: others	-4,686.45***	844.26	-4,828.32***	867.51	-4,828.21***	867.47
Relation to head: grandchild	-3,949.51***	826.46	-4,008.06***	819.36	-4,008.01***	819.36
Migration duration	422.77	265.62	372.27*	221.60	372.31*	221.65
Destination: Windhoek	759.91	605.81	268.28	372.54	268.67	372.05
Destination: abroad	19,449.51	17,326.39	18,843.68	16,845.75	18,844.16	16,846.45
Destination: Other towns	649.04	551.82	240.52	297.47	240.85	297.15
Total crop failure	-418.32	287.78	-467.25*	254.47	-467.21*	254.49
Low yields due to climate	273.12	332.25	394.44	246.99	394.34	247.00
Income of livestock products	0.18*	0.10	0.18*	0.11	0.18*	0.11
Constant	2,336.13**	1,076.14	2,642.36***	943.25	2,642.12***	943.32
Observations	1,163		1,163		1,163	
R-squared	0.17		0.17		0.17	
Hansen J statistic JP	0.90		0.97		0.99	

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

Remittances by migrant household head were significantly higher by N\$4000 than if the sender was a child or a grandchild and N\$4829 if the sender was any other household member. Remittances increased with duration of migrant at the destination perhaps because they would have had time to get better jobs and grow their social networks in their places of residents and work.

### **1.5.2. Impact on annual consumption spending**

Results of generated instruments are close to that obtained with combination of both the generated and exogenous instruments (Table 3-5). Migrant households on average spent significantly less annually on health, education clothing and housing than non-migrant households. However, among the migrant households, migration intensity had a positive impact on annual spending. Every additional migrant in a household on average led to an N\$ 4,955 increase in annual consumption expenditure. The results underscores the potential impact of migration in uplifting family welfare but there is a need to improve the quality of human capital through education and training.

Results suggest that migrant households were relatively poor compared to families that had no migrant member. The members of the relatively richer households in the communities could be entrepreneurs or commuting to work in the rapidly urbanizing towns of Oshakati, Ongwediva and Ondangwa (Frayne, Pendleton, & Pomuti, 2001). This paper's descriptive analysis shows migrants moved on their own due to lack of opportunities in their rural homes but many have no post school training that would give them critical skills for better rewarding jobs. Our results corroborate previous research which show most migrants go to Windhoek and are poor, food insecure, unemployed and live in informal settlements of the city (Pendleton et al., 2014). Conceptually, poverty induce migration and although the concept is well documented in the context of international migration (Adepoju, 2004; De Haas, 2005), it could as well apply to internal rural-urban type of migration.

The annual consumption spending also differed by gender of the household head. Female-headed households had between N\$4,651 and N\$ 4,655.78 less consumption expenditure than households headed by males. There were no significant regional differences in consumption expenditure. Households with a trained household head spent N\$10,590 more compared to those whose heads had no training. Every additional household member with vocational training increased average consumption spending by N\$ 5,878 *ceteris paribus*. Household heads with nonfarm occupation increased spending by N\$ 5,810.

Table 1-5: Impact on annual and monthly consumption expenditure

VARIABLES	Yearly consumption expenditure (NAD)				Monthly consumption expenditure (NAD)			
	GenInst <sup>4</sup>		GenExtInst <sup>5</sup>		GeneInst		GenExtInst	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Migration status	-22,924.43**	10,817.63	-22,845.34**	10,783.83	-163.44	372.81	-163.32	320.04
Number of migrants	4,969.57**	2,034.04	4,955.07**	2,027.93	71.31	91.31	71.29	81.62
Oshana region	-68.00	1,969.82	-66.63	1,968.68	-37.79	92.17	-37.79	91.27
Oshikoto region	-264.56	2,024.63	-267.25	2,023.33	213.78	174.67	213.77	176.20
Male head	-4,655.78**	1,816.59	-4,651.06**	1,814.99	-221.20	154.80	-221.20	157.56
Head age	107.00	262.75	107.09	262.60	8.51	13.02	8.51	12.85
Head age2	-0.63	2.12	-0.63	2.12	-0.05	0.10	-0.05	0.09
Head training	10,590.02***	3,118.46	10,585.78***	3,116.44	747.01**	352.63	747.01**	355.00
HH members with vocational training	5,878.19***	2,026.74	5,878.58***	2,025.61	263.89	170.44	263.88	171.24
Seasonal forecast	-2,937.35*	1,644.15	-2,937.90*	1,643.23	-150.38	147.33	-150.37	148.71
Head occupation: farmer	1,434.50	1,845.84	1,438.12	1,844.48	-48.99	126.54	-48.98	129.24
Head occupation: nonfarm	5,810.07**	2,378.67	5,809.33**	2,377.33	264.32**	131.94	264.32**	131.34
Head occupation: pensioner	415.44	2,086.66	414.76	2,085.49	73.61	111.24	73.61	111.27
Youth members	-530.74	591.83	-531.04	591.49	-16.52	20.71	-16.52	20.72
Dependents (children, elderly)	-400.24	394.93	-400.49	394.70	-33.36*	19.13	-33.36*	19.19
Members of working age	240.93	944.88	241.85	944.31	94.02*	56.78	94.02*	56.25
Access to mobile money services	5,020.41**	1,980.79	5,018.21**	1,979.57	317.78**	125.91	317.77**	129.78
Asset index	1,811.08***	593.67	1,811.53***	593.32	97.34***	28.44	97.34***	28.09
Tropical livestock units (tlu)	450.58***	78.80	450.80***	78.72	6.86	4.92	6.86	5.01
Risk taking	109.65	628.59	110.32	628.20	69.95	57.36	69.95	56.09
Affected by dry spell	1,462.07	2,054.10	1,462.05	2,052.95	265.47*	137.32	265.47*	138.11
Constant	5,540.47	9,436.62	5,504.88	9,424.92	-283.27	375.91	-283.31	373.41
Observations	648		648		648		648	
R-squared	0.13		0.13		0.12		0.12	
Hansen J statistic	0.33		0.33		0.508		0.395	

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

<sup>4</sup> Equation estimated with generated instruments  $Z$  from observed exogenous explanatory variables using linear two stage least squares regression.  $Z = (X_j - \bar{X}) * \varepsilon$

<sup>5</sup> This equation is estimated using both generated and the excluded instruments.

Households that had registered for mobile money services on average had N\$5400 more spending than households that did not have access. Wealth endowment as measured by physical assets, livestock assets and land holding was associated with higher consumption spending. A one percent increase in the asset index resulted in an N\$1,811 increase in annual spending. Increasing livestock ownership by one tropical unit led to an N\$ 450 increase in annual consumption spending.

### **1.5.3. Impact on monthly consumption spending (N\$)**

The household's quality of human capital and wealth status are evidently the key drivers of monthly consumption spending. Households whose heads had some form of post school training had N\$ 747 higher monthly consumption spending than those whose head had no training (Table 3-5). Having a household head engaged in nonfarm activities increased monthly consumption spending by N\$264.

While having an additional dependent (children and elderly) person led to a decline in household's average monthly spending by N\$33, a working age member increased the average spending by N\$94. Household composition and size could constitute one of the main sources of poverty trap (Woolard & Klasen, 2005). A one percent increase in asset index leads to an increase in monthly spending by at least N\$ 97. Access to mobile money services has significant positive impact on monthly consumption spending.

### **1.5.4. Impact on food expenditure and household food dietary diversity**

We do not find significant impact of migration on food spending and dietary diversity. The two outcomes did not differ by gender and across regions either. However, food spending increased with age. Elderly people might farm less and rely more on government old-age pension grants to buy food and meet other needs.

Education and training positively affect household food spending. Completing an additional grade on average increased food spending by about N\$ 14 and a one percent increase in dietary diversity. Having a household head with any form of post school training increased average spending on food by N\$158. Schooling and training increases the likelihood of getting higher returns through either a better paying nonfarm job or self-employment. Larger households had less diversified diets, which could be an indication of food and nutrition insecurity.

Table 1-6: impact on food spending, household dietary diversity index and uptake of adaptive strategies

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Total food expenditure (N\$)				Dietary diversity index				Adaptive strategies	
	GenInst		GenExtInst		GenInst		GenExtInst		GenInst	
	coef	se	coef	se	coef	se	coef	se	coef	se
Migration status	-93.80	235.11	-90.96	235.18	0.07	0.57	0.22	0.56	2.89	2.30
Number of migrants	26.65	45.68	26.13	45.70	-0.01	0.13	-0.05	0.12	-0.74*	0.43
Oshana region	13.33	42.19	13.39	42.19	-0.31	0.20	-0.30	0.20	-1.76***	0.50
Oshikoto region	48.22	37.54	48.08	37.54	-0.40**	0.19	-0.40**	0.18	-1.21**	0.52
Male head	-0.75	30.37	-0.58	30.37	0.03	0.15	0.04	0.15	0.36	0.44
Head age	2.28**	1.03	2.28**	1.02	0.00	0.01	0.00	0.01	0.03**	0.01
Head education	14.11***	4.51	14.11***	4.50	0.07***	0.02	0.07***	0.02	0.21***	0.06
Head training	158.22**	73.13	157.99**	73.12	0.02	0.30	0.01	0.30	-2.37***	0.81
Head occupation: farmer	-52.41*	31.79	-52.32	31.79	-0.33**	0.15	-0.32**	0.15	-0.88*	0.45
Vocational training	45.98	38.99	45.97	38.97	0.26	0.18	0.25	0.18	0.64	0.47
Members with tertiary education	35.66	50.98	35.75	50.94	0.10	0.25	0.11	0.25	0.59	0.66
Household size	-3.16	5.12	-3.17	5.11	-0.05**	0.02	-0.06**	0.02	0.30***	0.08
Access to mobile money services	140.03***	39.94	139.92***	39.91	0.05	0.18	0.04	0.18	-0.03	0.46
Asset index	75.10***	13.47	75.10***	13.47	0.36***	0.05	0.36***	0.05	0.44***	0.15
Log of income	5.30***	1.56	5.30***	1.56	0.02***	0.01	0.02***	0.01	0.08***	0.02
Tropical livestock units (tlu)	-1.17	1.08	-1.16	1.08	0.00	0.01	0.00	0.01	-0.00	0.02
Members contributing income	16.96	17.47	16.98	17.48	0.01	0.08	0.01	0.08	-0.14	0.23
Area crop (ha)	-4.80	8.07	-4.75	8.08	0.11***	0.04	0.11***	0.04	0.36***	0.12
Rain harvest	24.09	34.03	24.21	34.02	0.39**	0.16	0.39**	0.16		
Received government drought relief	23.39	36.94	23.48	36.93	0.06	0.18	0.06	0.18	0.81	0.53
High temperatures	44.57	36.01	44.53	36.00	0.74***	0.17	0.75***	0.17	1.14***	0.42
Dry spell	54.99	37.53	55.05	37.51	0.49***	0.18	0.49***	0.18	1.31***	0.47
Constant	132.75	148.52	131.38	148.75	5.37***	0.53	5.31***	0.53	3.04*	1.69
Observations	646		646		648		648		648	
R-squared	0.27		0.27		0.26		0.26		0.18	
Hansen J statistic	0.25		0.27		0.71		0.49		0.58	

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

Households whose members have registered for mobile money services spent more on food spending than those that had no access to such services. Mobile money signals access to financial services and those registered for the service are able to transact more or easily receive remittances. Wealth endowment increased both food spending and dietary diversity. Household food spending also increased with increase in non-farm income. Because of the subsistence nature of agriculture and inherent risks, non-farm income signals less participation in farming and more consumption of purchased food. Household's dietary diversity increased with expansion of cultivated area.

Households affected by exposure to extreme temperatures and dry spells were more diversified in their diets. Dry spells and high temperatures reduces people's capacity to grow their own food making them more reliant on markets and food relief from government.

#### **1.5.5. Impact on uptake of adoption strategies**

Results indicate no statistically significant difference in the number of adaptive strategies taken-up between the migrant and non-migrant households (Table 6). However, among the migrant households, we see a significant inverse relationship between the number of migrants and the households' adaptive capacity. This could point to of failure of other local adaptation mechanisms for those households, forcing them to use migration as an adaptive strategy rather than an enabler of the adaption process.

The paucity of empirical papers linking migration and climate change adaptation makes it difficult to pick a general trend or draw conclusion. Our result corroborate findings by Alem et al. (2018) that households use migration to cope with climate risk *ex ante*. However, we do not find evidence to support the findings by Karanja Ng'ang'a et al. (2016) which found migrant households in pastoral communities to have adopted more costly adaptive strategies due to relaxed credit constraint. A study by Mendola (2008) concluded that low-return migration with low entry costs had no impact enhancing production. Our descriptive analysis has shown that most migrants engaged in this kind of migration and most are unskilled.

The number of adaptive strategies adopted increased with age and education of the household head. However, there was negative correlation between the household's adaptive capacity and the training of its head signalling their high opportunity cost of engaging in high-risk subsistent farming. They can earn better returns on the training in non-farm sector and pay less attention to farming. Results also suggest that households with fewer opportunities may be forced to explore more nonfarm adaptive strategies.

Adaptive capacity of the household increased with asset ownership, income, household size and land area cultivated. Expanding the cultivated area require more family labour especially in poor households who can hardly afford to hire labour.

This study also shows that households that perceived changes in high temperatures and dry spells had more adaptive strategies suggesting the importance of awareness creation on climate change, exposure to climate risk and alternative adaptive options available to communities. The uptake of adaptive strategies differed by region. Households in Omusati region reported more adaptive strategies than those in Oshana and Oshikoto regions. Oshana region is more commercial and urbanized than the other two regions.

## 1.6. Conclusion

The link between migration and environmental factors and disasters has not received much attention in the past (Melde, 2017). Namibia's rural population remain vulnerable to negative effects of climate change. Most of the existing studies have focused in how changes in climate affects people's mobility looking at migration as a response to those changes and as an adaptive strategy. Another emerging body of literature has shifted focus to look at migration as an enabler of the climate change adaptation by relaxing liquidity and credit constraints through remittances, information flow, and technology transfer. This paper contributes to this ongoing discussion by evaluating how migration affects wellbeing outcomes of vulnerable communities living in semi-arid environments and if indeed, it has an impact on their adaptive capacity.

We find that most migrants are young and the main motivating factors are to look for work or seek better education. Poverty and lack of economic opportunities in the rural villages are the main push factor driving migration to towns and cities. The most common form of migration is rural-urban with low entry costs but less lucrative. The most popular destination for the majority of migrants is Windhoek city and previous studies show an increasing rate of urban poverty especially among the unskilled migrants who live in informal settlements.

The majority of the migrants lack post school skills training and tertiary education. Past studies have identified these two factors as key for migrants to secure better returns in non-farm sector employment. Only a fifth of migrants accessed tertiary education and the majority of them were females. Our findings show that higher education and post school skills training are key determinates of the amount of remittances received by migrant households and therefore migration outcome.

Migrant households had less consumption expenditure, with no significant difference in food spending or dietary diversity. Our results suggest that migrant households are relatively deprived compared to families without migrants. However, this is not to say that migration has no role in alleviating poverty and improving living standards of migrant households. We find that the average annual consumption spending among the migrant households increased by N\$ 4,955 for every additional migrant. This shows potential impact migration could have as a livelihood diversification and adaptive strategy.

Unlike previous studies elsewhere (Karanja Ng'ang'a et al., 2016), we find no evidence to support that migration enhanced the adaptive capacity of the communities in semi-arid Namibia. On the contrary, household's adaptive capacity declined with number of migrants

perhaps indicating failure of local adaptation mechanism for poor households. Relatively deprived households would rather meet the basic needs first before investing in costly adaptive strategies. We also think that heavy reliance on government drought relief and cash transfers for the elderly (pension grants) may reduce people's incentive for self-protection. Three quarters of the households received government drought relief.

Based on our findings, migration has potential as an adaptive and risk mitigation strategy against climate variability, but poverty, lack of post school skills training and low transition to tertiary level training are key barriers. There is need for public policy on targeted if not universal higher education and youth training to unlock the benefits of migration as a livelihood diversification strategy and an enabler of climate change adaptation. Skills composition of members in migrant households and information on alternative adaptive options are a prerequisite for utilization of remittances in sustainable long-term adaptation and resilience.

- Adamo, S. B. (2008). Addressing environmentally induced population displacements: a delicate task. *Background Paper for the Population-Environment Research Network Cyberseminar "Environmentally Induced Population Displacements"*, 18-29.
- Adams, R., Lopez-Feldman, A., Mora, J., Taylor, J., DeWind, J., & Holdaway, J. (2008). Remittances, inequality and poverty: Evidence from rural Mexico. *Migration and development within and across borders: Research and policy perspectives on internal and international migration*, 101-130.
- Adams, R. H., & Page, J. (2005). Do international migration and remittances reduce poverty in developing countries? *World development*, 33(10), 1645-1669.
- Adepoju, A. (2004). Trends in international migration in and from Africa. *International migration: Prospects and policies in a global market*, 59-76.
- Adger, W. N., Huq, S., Brown, K., Conway, D., & Hulme, M. (2003). Adaptation to climate change in the developing world. *Progress in development studies*, 3(3), 179-195.
- Alderman, H., & Haque, T. (2007). *Insurance against covariate shocks: The role of index-based insurance in social protection in low-income countries of Africa*: World Bank Publications.
- Alem, Y., Maurel, M., & Millock, K. (2018). Migration as an adaptation strategy to weather variability: An instrumental variables probit analysis. In *Agricultural Adaptation to Climate Change in Africa* (pp. 384-403): Routledge.
- Azzarri, C., & Zezza, A. (2011). International migration and nutritional outcomes in Tajikistan. *Food Policy*, 36(1), 54-70.
- Bals, C., Warner, K., & Butzengeiger, S. (2006). Insuring the uninsurable: design options for a climate change funding mechanism. *Climate Policy*, 6(6), 637-647.
- Bardsley, D. K., & Hugo, G. J. (2010). Migration and climate change: examining thresholds of change to guide effective adaptation decision-making. *Population and Environment*, 32(2), 238-262. doi:10.1007/s11111-010-0126-9
- Barnett, B. J., Barrett, C. B., & Skees, J. R. (2008). Poverty Traps and Index-Based Risk Transfer Products. *World Development*, 36(10), 1766-1785. doi:<https://doi.org/10.1016/j.worlddev.2007.10.016>

- Barrios, S., Bertinelli, L., & Strobl, E. (2006). Climatic change and rural–urban migration: The case of sub-Saharan Africa. *Journal of Urban Economics*, 60(3), 357-371.  
doi:<http://dx.doi.org/10.1016/j.jue.2006.04.005>
- Batisani, N., & Yarnal, B. (2010). Rainfall variability and trends in semi-arid Botswana: Implications for climate change adaptation policy. *Applied Geography*, 30(4), 483-489.  
doi:<http://dx.doi.org/10.1016/j.apgeog.2009.10.007>
- Baum, C. F., Lewbel, A., Schaffer, M. E., & Talavera, O. (2012). *Instrumental variables estimation using heteroskedasticity-based instruments*. Paper presented at the United Kingdom Stata User's Group Meetings.
- Binswanger-Mkhize, H. P. (2012). Is there too much hype about index-based agricultural insurance? *Journal of Development studies*, 48(2), 187-200.
- Black, R., Adger, W. N., Arnell, N. W., Dercon, S., Geddes, A., & Thomas, D. (2011). The effect of environmental change on human migration. *Global Environmental Change*, 21, S3-S11.  
doi:<http://dx.doi.org/10.1016/j.gloenvcha.2011.10.001>
- Black, R., Bennett, S. R. G., Thomas, S. M., & Beddington, J. R. (2011). Climate change: Migration as adaptation. *Nature*, 478(7370), 447-449.
- Black, R., Kniveton, D., Skeldon, R., Coppard, D., Murata, A., & Schmidt-Verkerk, K. (2008). *Demographics and Climate Change: Future Trends And their Policy Implications for Migration*. Retrieved from University of Sussex, UK
- Boano, C., & Morris, T. (2008). *Environmentally displaced people Understanding the linkages between environmental change, livelihoods and forced migration*. Retrieved from University of Oxford:
- Brick, K., & Visser, M. (2015). Risk preferences, technology adoption and insurance uptake: A framed experiment. *Journal of Economic Behavior & Organization*, 118, 383-396.  
doi:<https://doi.org/10.1016/j.jebo.2015.02.010>
- Carletto, C., Covarrubias, K., & Maluccio, J. A. (2011). Migration and child growth in rural Guatemala. *Food Policy*, 36(1), 16-27.
- Castles, S. (2002). *Environmental change and forced migration: making sense of the debate* Working paper. (Working Paper No. 70 ). Geneva.
- Chantararat, S., Mude, A. G., Barrett, C. B., & Carter, M. R. (2013). Designing index-based livestock insurance for managing asset risk in northern Kenya. *Journal of Risk and Insurance*, 80(1), 205-237.
- Conway, D., & Schipper, E. L. F. (2011). Adaptation to climate change in Africa: Challenges and opportunities identified from Ethiopia. *Global Environmental Change*, 21(1), 227-237.
- Crush, J., & Caesar, M. (2017). *Food remittances: rural-urban linkages and food security in Africa (report, pp. i-39)*. Retrieved from London:
- Damon, A. L. (2010). Agricultural land use and asset accumulation in migrant households: the case of El Salvador. *The Journal of Development Studies*, 46(1), 162-189.
- De Brauw, A. (2011). Migration and child development during the food price crisis in El Salvador. *Food Policy*, 36(1), 28-40.
- De Haas, H. (2005). International migration, remittances and development: myths and facts. *Third World Quarterly*, 26(8), 1269-1284. doi:10.1080/01436590500336757
- Dessai, S., Adger, W. N., Hulme, M., Turnpenny, J., Köhler, J., & Warren, R. (2004). Defining and Experiencing Dangerous Climate Change. *Climatic Change*, 64(1), 11-25.  
doi:10.1023/b:clim.0000024781.48904.45
- Elum, Z. A., Modise, D. M., & Marr, A. (2017). Farmer's perception of climate change and responsive strategies in three selected provinces of South Africa. *Climate Risk Management*, 16, 246-257. doi:<https://doi.org/10.1016/j.crm.2016.11.001>
- Fraser, E. D., Dougill, A., Hubacek, K., Quinn, C., Sendzimir, J., & Termansen, M. (2011). Assessing vulnerability to climate change in dryland livelihood systems: conceptual challenges and interdisciplinary solutions. *Ecology and Society*, 16(3).

- Frayne, B. (2004). Migration and urban survival strategies in Windhoek, Namibia. *Geoforum*, 35(4), 489-505.
- Frayne, B. (2007). Migration and the changing social economy of Windhoek, Namibia. *Development Southern Africa*, 24(1), 91-108.
- Frayne, B., Pendleton, W., & Pomuti, A. (2001). Urban development and community participation in Oshakati, Northern Namibia. *Associational Life in African Cities: Popular Responses to the Urban Crisis*, 282-303.
- Giuliano, P., & Ruiz-Arranz, M. (2009). Remittances, financial development, and growth. *Journal of Development Economics*, 90(1), 144-152.  
doi:<http://dx.doi.org/10.1016/j.jdeveco.2008.10.005>
- Grace, K., Hertrich, V., Singare, D., & Husak, G. (2018). Examining rural Sahelian out-migration in the context of climate change: An analysis of the linkages between rainfall and out-migration in two Malian villages from 1981 to 2009. *World Development*, 109, 187-196.
- Gregory, J. N. (1989). Dust Bowl Legacies: The Okie Impact on California, 1939-1989. *California History*, 68(3), 74-85.
- Gregory, J. N. (1991). *American exodus: The dust bowl migration and Okie culture in California*: Oxford University Press, USA.
- Greiner, C. (2011). MIGRATION, TRANSLOCAL NETWORKS AND SOCIO-ECONOMIC STRATIFICATION IN NAMIBIA. *Africa: Journal of the International African Institute*, 81(4), 606-627.
- Gupta, S., Pattillo, C. A., & Wagh, S. (2009). Effect of Remittances on Poverty and Financial Development in Sub-Saharan Africa. *World development*, 37(1), 104-115.  
doi:<http://dx.doi.org/10.1016/j.worlddev.2008.05.007>
- Hazell, P. B., & Hess, U. (2010). Drought insurance for agricultural development and food security in dryland areas. *Food Security*, 2(4), 395-405.
- Jensen, N., & Barrett, C. (2017). Agricultural index insurance for development. *Applied Economic Perspectives and Policy*, 39(2), 199-219.
- Junge, V., Revilla Diez, J., & Schätzl, L. (2015). Determinants and Consequences of Internal Return Migration in Thailand and Vietnam. *World Development*, 71, 94-106.  
doi:<https://doi.org/10.1016/j.worlddev.2013.11.007>
- Karamba, W. R., Quiñones, E. J., & Winters, P. (2011). Migration and food consumption patterns in Ghana. *Food Policy*, 36(1), 41-53. doi:<http://dx.doi.org/10.1016/j.foodpol.2010.11.003>
- Karanja Ng'ang'a, S., Bulte, E. H., Giller, K. E., McIntire, J. M., & Rufino, M. C. (2016). Migration and self-protection against climate change: a case study of Samburu County, Kenya. *World Development*, 84, 55-68.
- Karuaihe, S. T., & Wandschneider, P. R. (2018). Limited access to services for the urban poor in Windhoek, Namibia. *Development Southern Africa*, 35(4), 466-479.
- Kniveton, D., Schmidt-Verkerk, K., Smith, C., & Black, R. (2008a). Climate change and migration: improving methodologies to estimate flows.
- Kniveton, D., Schmidt-Verkerk, K., Smith, C., & Black, R. (2008b). *Climate change and migration: improving methodologies to estimate flows* (MRS No.33). Retrieved from Geneva: <http://eprints.soas.ac.uk/id/eprint/18162>
- Laczko, F., & Sheean, O. (2010). *Migration, the environment and climate change: assessing the evidence* (F. Laczko Ed.). Geneva, Switzerland: International Organization for Migration.
- Lall, S. V., Selod, H., & Shalizi, Z. (2006). *Rural-urban migration in developing countries: A survey of theoretical predictions and empirical findings*: The World Bank.
- Lanzona, L. A. (1998). Migration, self-selection and earnings in Philippine rural communities. *Journal of Development Economics*, 56(1), 27-50. doi:[https://doi.org/10.1016/S0304-3878\(98\)00051-0](https://doi.org/10.1016/S0304-3878(98)00051-0)
- Lee, E. S. (1966). A theory of migration. *Demography*, 3(1), 47-57.
- Lewbel, A. (2012). Using heteroscedasticity to identify and estimate mismeasured and endogenous regressor models. *Journal of Business & Economic Statistics*, 30(1), 67-80.

- Lewbel, A. (2018). Identification and estimation using heteroscedasticity without instruments: The binary endogenous regressor case. *Economics letters*, 165, 10-12.  
doi:<https://doi.org/10.1016/j.econlet.2018.01.003>
- Linnerooth-Bayer, J., & Mechler, R. (2006). Insurance for assisting adaptation to climate change in developing countries: a proposed strategy. *Climate policy*, 6(6), 621-636.
- Mahul, O., & Skees, J. R. (2007). Managing agricultural risk at the country level: The case of index-based livestock insurance in Mongolia.
- Marchiori, L., Maystadt, J.-F., & Schumacher, I. (2012). The impact of weather anomalies on migration in sub-Saharan Africa. *Journal of Environmental Economics and Management*, 63(3), 355-374.
- McCabe, J., Smith, N., Leslie, P., & Telligman, A. (2014). Livelihood diversification through migration among a pastoral people: contrasting case studies of Maasai in northern Tanzania. *Human organization*, 73(4), 389-400.
- McKenzie, D., & Yang, D. (2010). *Experimental approaches in migration studies*: The World Bank.
- McLeman, R. (2006). Migration out of 1930s rural eastern Oklahoma: insights for climate change research. *Great Plains Quarterly*, 26(1), 27-40.
- McLeman, R. A., & Hunter, L. M. (2010). Migration in the context of vulnerability and adaptation to climate change: insights from analogues. *Wiley Interdisciplinary Reviews: Climate Change*, 1(3), 450-461.
- Melde, S. (2017). The Environment, Climate Change, and Disasters: Mainstreaming Migration into Climate Change Adaptation, Disaster Risk Reduction, and Development Plans. In G. M. Group' (Ed.), *Handbook for Improving the Production and Use of Migration Data for Development*. Washington, DC: World Bank
- Mendola, M. (2008). Migration and technological change in rural households: Complements or substitutes? *Journal of Development Economics*, 85(1), 150-175.
- Menon, N. (2009). Rainfall uncertainty and occupational choice in agricultural households of rural Nepal. *The Journal of Development Studies*, 45(6), 864-888.
- Mergo, T. (2016). The Effects of International Migration on Migrant-Source Households: Evidence from Ethiopian Diversity-Visa Lottery Migrants. *World Development*, 84, 69-81.
- Meze-Hausken, E., Patt, A., & Fritz, S. (2009). Reducing climate risk for micro-insurance providers in Africa: A case study of Ethiopia. *Global Environmental Change*, 19(1), 66-73.
- Möllers, J., & Meyer, W. (2014). The effects of migration on poverty and inequality in rural Kosovo. *IZA Journal of Labor & Development*, 3(1), 16.
- Myers, N. (2005). Environmental Refugees: An Emergent Security Issue. 13th Economic Forum. Prague, 23-27 May 2005. In: NGO/4/05.
- Nguyen, L. D., Raabe, K., & Grote, U. (2015). Rural–Urban Migration, Household Vulnerability, and Welfare in Vietnam. *World Development*, 71, 79-93.  
doi:<https://doi.org/10.1016/j.worlddev.2013.11.002>
- Niikondo, A. (2010). Migrants to cities and towns in Namibia: What their interests are?
- NSA. (2011). *Namibia 2011: Population & Housing Census Main Report*: Namibia Statistics Agency.
- Nyamongo, E. M., Misati, R. N., Kipyegon, L., & Ndirangu, L. (2012). Remittances, financial development and economic growth in Africa. *Journal of Economics and Business*, 64(3), 240-260. doi:<http://dx.doi.org/10.1016/j.jeconbus.2012.01.001>
- Oakies, J. G. (1989). American Exodus: The Dust Bowl Migration and Okie Culture in California.
- Olivier, M. (2016). *Migration in Namibia: A country profile 2015*. Retrieved from Geneva , Switzerland:
- Pendleton, W., Crush, J., & Nickanor, N. (2014). *Migrant Windhoek: Rural–urban migration and food security in Namibia*. Paper presented at the Urban Forum.
- Quisumbing, A., & McNiven, S. (2010). Moving forward, looking back: The impact of migration and remittances on assets, consumption, and credit constraints in the rural Philippines. *The Journal of Development Studies*, 46(1), 91-113.

- Ratha, D., Mohapatra, S., Ozden, C., Plaza, S., Shaw, W., & Shimeles, A. (2011). *Leveraging migration for Africa: Remittances, skills, and investments*: The World Bank.
- Rechkemmer, A., O'Connor, A., Rai, A., Decker Sparks, J. L., Mudliar, P., & Shultz, J. M. (2016). A complex social-ecological disaster: Environmentally induced forced migration. *Disaster Health, 3*(4), 112-120. doi:10.1080/21665044.2016.1263519
- Reid, H. (2007). *The economic impact of climate change in Namibia: how climate change will affect the contribution of Namibia's natural resources to its economy* (Vol. 7): IIED.
- Reid, H., Sahlén, L., Stage, J., & MacGregor, J. (2008). Climate change impacts on Namibia's natural resources and economy. *Climate Policy, 8*(5), 452-466.
- Seckelmann, A. (1997). Low-income Housing Projects in Windhoek, Namibia.
- Siddique, H. M. A., Shehzadi, I., Manzoor, M. R., & Majeed, M. T. (2016a). Do international migration and remittances reduce poverty in developing countries? *Science International Lahore, 28*(2)(2016), 1519-1524.
- Siddique, H. M. A., Shehzadi, I., Manzoor, M. R., & Majeed, M. T. (2016b). Do international migration and remittances reduce poverty in developing countries?
- Smith, V. H. (2016). Producer Insurance and Risk Management Options for Smallholder Farmers. *The World Bank Research Observer, 31*(2), 271-289.
- Spear, D., Baudoin, M.-A., Hegga, S., Zaroug, M., Okeyo, A., & Haimbili, E. (2014). *Vulnerability and Adaptation to Climate Change in the Semi-Arid Regions of Southern Africa*. Retrieved from Canada:
- Stark, O., & Bloom, D. E. (1985). The new economics of labor migration. *The American Economic Review, 75*(2), 173-178.
- Tacoli, C. (2009). Crisis or adaptation? Migration and climate change in a context of high mobility. *Environment and urbanization, 21*(2), 513-525.
- Tacoli, C. (2011). *Not only climate change: mobility, vulnerability and socio-economic transformations in environmentally fragile areas in Bolivia, Senegal and Tanzania*: IIED.
- Taylor, J. E., & Lopez-Feldman, A. (2010). Does migration make rural households more productive? Evidence from Mexico. *The Journal of Development Studies, 46*(1), 68-90.
- Wang, J., Brown, D. G., & Agrawal, A. (2013). Climate adaptation, local institutions, and rural livelihoods: A comparative study of herder communities in Mongolia and Inner Mongolia, China. *Global Environmental Change, 23*(6), 1673-1683.  
doi:<http://dx.doi.org/10.1016/j.gloenvcha.2013.08.014>
- Webber, M., & Barnett, J. (2010). *Accommodating migration to promote adaptation to climate change*: The World Bank.
- Woolard, I., & Klasen, S. (2005). Determinants of Income Mobility and Household Poverty Dynamics in South Africa. *The Journal of Development Studies, 41*(5), 865-897.  
doi:10.1080/00220380500145313
- Wouterse, F. (2012). Migration and rural welfare: the impact of potential policy reforms in Europe. *World Development, 40*(12), 2427-2439.
- Wouterse, F., & Taylor, J. E. (2008). Migration and income diversification:: Evidence from burkina faso. *World Development, 36*(4), 625-640.
- Zeza, A., Carletto, C., Davis, B., & Winters, P. (2011). Assessing the impact of migration on food and nutrition security. *Food Policy, 36*(1), 1-6.