# Determinants of credit constraints in Ethiopia

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Abstract

A well-functioning financial system plays an important role in resources allocation and credit expansion, and is vital in stimulating economic growth by fueling investment and consumption. Development of efficient financial system should therefore be one of the main priorities of a developing nation such as Ethiopia. The county has achieved phenomenal economic growth over the last decades and advanced well in modernizing its financial sector. However, the financial sector in the country is one of the least developed in the world. In order to sustain the growth achieved in the recent past, the financial sector needs to be more efficient and inclusive. Identification of the credit-constrained households is a vital step in that process. Ethiopian Socioeconomic survey (ESS) was made available for this thesis and it was useful in providing valuable information about the households' credit situation. For this study, the aim has been to identify determinants of credit constraint in Ethiopia. These includes investigation of variables such personal, household and demographical characteristics of the households. Regression based on bivariate probit model with sample selection using maximum-likelihood estimations has been performed on the dataset. Descriptive methods shaded additional light on the available survey. The study uncovered that age, gender, education of the household head along with the size and location of the household influenced the households' fate in the credit market. The findings of this study and studies like this could have impact further than the academic world. Policy makers benefit from such information when they devise strategies to move towards a fairer and more inclusive credit sector.

Keywords: Credit constraints, formal lenders, informal lenders, credit market in Ethiopia, policy making

Abbreviation:

NBE = National Bank of Ethiopia

CBE = Commercial Bank of Ethiopia

MFWA = Making Finance Work (4) Africa

MFI = Micro Finance Institutions

SACCO = Savings and Credit Co-operative Societies

DBE = Development Bank of Ethiopia

ERSS = Ethiopian Rural Socioeconomic Survey

ESS = Ethiopia Socio-economic Survey

EA = Enumeration Areas

CSA = Central Statistics Agency of Ethiopia

REST = Relief Society of Tigray

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1 Chapter

1.1 Introduction:

Ethiopia is geographically located in the horn of Africa. The country shares its northern border with Eritrea, the eastern with Djibouti and Somalia, the western with Sudan and South Sudan and the southern with Kenya. With its 1.1 million km^2 area the country is subdivided into 9 regional states, the Dire Dawa city and the capital city Addis Ababa (Commission, 2008).

The largest contributor to the Ethiopian economy is the agricultural sector. The agricultural sector makes up more than 80 % of exports and just above 45% of the GDP (Wiedmaier-Pfister et al., 2008). The major export crops produced in the agricultural sector are coffee beans, oil seeds and flowers (Getnet, 2014). This sector has been one of the main fuels of the countries much talked about growth over the past decade. However, the agricultural sector still remains largely inefficient (Getnet, 2014).

The Agricultural sector employs around 85% of the work force (Getnet, 2014). The majority of Ethiopian farmers are smallholder farmers with about a hectare of land per household in average (Obo, 2009). Additionally these farmers use outdates farming systems often relaying on the unpredictable rainy seasons (Getnet, 2014). Ethiopia has been hit by several drought over its resent history(Bachewe et al., 2016). These draughts have often led to a widespread famine over the entire country. The current drought in the country is related to a weather phenomena known as El Niño (Bachewe et al., 2016). It has persisted for several years and has led to the worst drought in 50 years. More than 10 million people are reported to be in need of food aid, and about half million children suffering from malnutrition(Bachewe et al., 2016). The frequent incidence of the El Niño over the last decades has been attributed to the climate changes due to global warming. If these effects persist the livelihood of many small scale farmers will be compromised and in some cases they will have fatal consequences unless a solution is found(Wolde-Georgis, 1997). The efficiency issue in the agricultural sector is not solely constrained to the dependency on climate conditions. The size of the farms together with the old fashioned methods employed by the farmers affect also their productivity even when the rainy seasons are satisfactory(Getnet, 2014). The aforementioned factors along with the lack of fertilizers and high yield seeds in the smallholder farmers' inventory hampers the future prospects of the agricultural sector(Obo, 2009).

Most of the farmers in Ethiopia reside in the rural areas. Above 80% the 90 million people are currently found in rural areas(Obo, 2009). The rural population faces lack of basic health and education facilities and frail transport, communication and power services. In addition most of these households are often living below the poverty line(Obo, 2009).

To meet the food demand of the expanding Ethiopian population the agricultural sector needs increase productivity considerably(Bachewe et al., 2016). The hardships that is likely to be caused by the ongoing global climate change, reduction of farmable land due to urbanization and cyclic nature of commodity price makes solving the shortcomings of the agricultural sectors even more urgent. In order to attain higher productivity in the agricultural sector, the farmers need to gain access to modern farming equipment. The dependence on the climatic conditions can be reduced by improving irrigation facilities and use of ground water. The productivity could be further improved by giving access of fertilizers and high yield seeds to the majority of the farmers(Dercon and Hill, 2009).

The suggestions mentioned above are expensive, and the smallholder farmers living under the poverty line with limited access to credit markets are excluded from enjoying the benefits of modern technology. The formal financial sector in Ethiopia have inadequate inclusion of the rural areas(Obo, 2009). This can be explained in part by the uncertainty related to smallholder farmers' income, lack of collateral and development of the rural markets. On the other hand the informal credit markets are often unreliable and expensive. In addition to the lack of access to the credit market, the rural farmers cannot sell or use their land as collateral due to the governments land policy(Obo, 2009). The access of financial services such as deposit accounts, credit and insurance are therefore central to the process of improving to the productivity of the agricultural system and improving the living standard of the rural population. Having access to the financial services enables the poor rural population to make investments that improve the productivity of their land such as better seeds, fertilizers and improving irrigation facilities(Dercon and Hill, 2009). These investments make the smallholder farmers more robust to unexpected to adversities (fluctuating prices, plant disease, variations in the amount of rain). Development of inclusive and fair financial sector in the rural markets is important for welfare and future economic prospects of the rural population and the overall economic outlook.

This study focus on understanding the mechanisms that control credit distribution in Ethiopia using the Ethiopian Socio-economic survey (ESS). Descriptive and regressions analysis are performed on the dataset that was made available for this study. The descriptive results is

designed to aid the regression analysis in interpreting the various variables and their effect on who receives and who is denied credit. Bivariate Probit regression with sample selection method is used to model the regression analysis and divide the represented households in to those with and without demand for credit. The ones without demand for credit are left out and further analysis is carried out on the remaining households. The formal and informal credit sectors are studied separately prior to a summary of the combined effect. This is done in order to get a detailed understanding of the credit markets. Variables such as household size, gender, education level of the household head and differences across the regional states are examined for both sectors. In addition, an overall assessment of the borrowers and lenders is also undertaken.

Understanding the circumstance around the financial institutions in particular the rural market is a vital step in solving the rural credit conundrum (Dercon and Hill, 2009). In order to expand the financial institution, one needs to understand the group that has demand that is met and which has the unmet demand. This understanding has importance beyond the academic world. The Policy makers can use such information in devising targeted strategies to impact groups that have been discriminated. These policies can have huge implication for the individuals and households that are directly or indirectly affect especially for the rural small-scale farmers.

Studies using similar methods have been earlier conducted in Ethiopia using an older dataset. The same methods have also been applied elsewhere in examining the credit markets. There is a successful study using data from Mexico has been executed in order to measure the incidence of credit constraint. This study differs from the others as a new dataset has been provided by center for statistics agency of Ethiopia (CSA) and the World Bank.

The next chapter focuses on the theoretical background of financial systems especially the financial sector in Ethiopia. It is followed by the data and methodology chapter III. The survey used in this thesis is reviewed along with the methods used in examining it. The results of the descriptive and regression analysis are described in chapter IV, while discussion and conclusion follow is in chapter V.

2 Chapter

2.1 Theory

2.1.1 Financial markets

The practice of lending and borrowing in human history can be traced back to Babylon. The Babylonians introduced a legal framework to regulate the custom of loaning money and goods as early as 1800 B.C(Armstrong, 2016). Valid loans at the time of the Babylonians had to include a written contract with the oversight of a public official. These contracts could include a pledge of security in form of land and other possessions including the wife, children and slaves of the borrower. The state regulated interest rates by setting maximum annual interest rate the lender could claim from the borrower (Armstrong, 2016).[1] The legal systems and institutions around borrowing and lending has been evolving and improving throughout the major human civilizations since then[2] (Dennis, 2015).

Credit is today broadly defined as an «agreement or promise» of transaction between lender and borrowers, where borrowers receive something of assessment now and repays sometime in the future(Hodgman, 1960). A well-functioning financial system that makes an efficient transaction of credit possible is essential to the functioning of the overall economy. Effective resource allocation and credit expansion materializes as a result of a well-functioning financial system, and leads to economic growth by increasing investment and consumption (Khan and Semlali, 2000). The process of credit and liquidity provision has various participants with their own distinct roles and interests. The main participants in the loan markets include lenders, borrowers, regulators and governments.

Lenders participate in the financial system by providing credit and liquidity to the borrowers(Hodgman, 1960). In return the lenders expect to be repaid in timely manner with interest and/or fees that are agreed on the terms of the loan. Interest rate on the credit varies based on the amount, riskiness of the borrower and the supply and demand of credit in the loan market. The banking sector is central to any financial system and play a pivotal role in suppling credit to the market(http://fsi.gov.au/, 07.12.2014). However, lender can also be a private person, a group of people, companies or even governments. The funds provided cover various types of needs such as mortgage payments, start-ups, business expansions and consume.

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[1] https://www.armstrongeconomics.com/research/a-brief-history-of-world-credit-interest-rates/3000-b-c-500-a-d-the-ancient-economy/

[2] http://www.encyclopediaofcredit.com/History-of-Credit

By consuming the credit made available by the lender, borrowers play an important role in the financial system. Borrowers enter the financial market intending to get a loan to cover a need. As with the lenders, the borrower can be a single person, group of people, companies or even governments.

In order to ensure a smooth interaction between the lenders and the borrowers, the financial system needs to be fair, transparent and non-discriminatory (Khan and Semlali, 2000). This is achieved by having a responsible set of lenders and borrowers. However, one cannot assume that every participant in the market always approaches the market with integrity (Spence, 1981). Therefore having a strong and impartial regulatory organ is essential. The regulation from the government follows the constitutional law and protects both participators. Governments have several roles in the financial markets in addition to being providers and consumers of credit in the market(Addison and Geda, 2001). Since the looking after the long term national interest is one of government's main responsibilities, it has to develop policies that allow the financial systems to function in a way that benefits the people (Addison and Geda, 2001).

Transaction of credit in general involves risk for the lenders and borrowers (Spence, 1981). Understanding the risk involved when a lender approves a loan to a borrower is vital to the pricing of the loan. The wellbeing of the overall economy depends also in the ability of the banking sector to measure the risk (Geda and Yimer, 2014). In general individual, public and private debtors are often checked for their credit worthiness before credit transaction is made. In addition, preserving scheme such as requirements of collateral and assets are mostly required by lenders as insurance. Beside such measurement of borrower's ability, lenders can further use signaling and screening system (Spence, 1981).

We can frame the loan market by dividing preference and characteristic of lenders and borrowers. Based on the source of the credit the interaction between lenders and borrows can take place in both a formal and informal market. Following Fichera`s description formal market is defined as regulated and licensed institution by financial and central bank (Fichera, 2010). Whereas, an informal market is characterized by the lack of regulatory supervision. As shown in table 2.1 informal lenders includes loan from relative, friends, moneylender etc. The categories for formal lenders include commercial banks, "micro creditors", cooperatives etc.

Table 2-1 Description of formal and informal lenders

Formal lenders	Informal lenders
Banks	Friends and relatives
Cooperative	Sosial insurance (Iddir)
Governmental programs	Saving Programs (Equb)
Women's Association	Grocery/local merchants
HAB Project	Money lenders
Mobile	Neighbors
Private banks	
Micro and smal Enterprise	

Fischera highlights that the relationship between formal and informal market as to be indeterminate, based on the existing theories (Fichera, 2010). Literature found this relationship to be substitution, complementary and competitive(Fichera, 2010). Household that might be constrained from the formal market can use the informal market as complementary. Furthermore, competition between this to lenders might increase the demand only form one suppliers, (this is also known as crowding out)(Spence, 1981). Substitution relationship relies on availability of both, and the use of previous credit on affecting credit-worthiness of the household, for example increase in credit-worthiness if household have had credit from formal market earlier and (vice versa)(Fichera, 2010). Borrowers approach informal lenders for several reasons such as accessibility and rejection by the formal lenders. The borrower capacity to pay the price of a loan from the formal market can also be considered as a reason to approach the informal market(Obo, 2009).

2.2 Financial system in Ethiopia

The current market based financial system in Ethiopia is relatively young. Following the overthrowing of Emperor Haile Selassie in 1974, Ethiopia was under control of Derg with Marxism-Leninism as its state ideology(Clark, 2000). During this era the Ethiopian financial system followed in the footsteps of their Soviet counterparts. As a consequence of that the tools needed to regulate and supervise financial markets in a market-based financial system were underdeveloped towards the end of that era(Clark, 2000). Since fall of the Derg in 1991 the country has been pursuing "gradualism" as a strategy for the financial system(Clark, 2000). The strategy involves an incremental privatization of the many of the state owned financial institution and enterprises, and further strengthening of regulatory and supervisory organs of the financial systems. This process leads to the emergence of new financial institutions, and preexisting institutions redefining their roles as the country heads towards a more market based financial system. (Addison and Geda, 2001).

Since the introduction of the market based system in 1991, the financial system has witnessed the introductions of many private banks and reform in the state owned financial institutions (Addison and Geda, 2001). The whole process started in 1992 with the establishment of market based foreign exchange(Addison and Geda, 2001). A reform of the National Bank of Ethiopia (NBE) and the introduction of private banks and insurance companies in 1994 followed the initial steps taken as part of the new fiscal policy (Addison and Geda, 2001). NBE was assigned regulatory and supervisory tasks. Development of the tools necessary to regulate and supervise was set as one of its main priorities. Moreover several private banks and insurance companies were allowed to enter the market (Addison and Geda, 2001). Private Banks have increased their market share from 0% in 1996(Addison and Geda, 2001) to 45% of loans and advances now (MFWA)[3](Africa, 2016). The demand for credit from the private sector grew as several small and medium sizes state owned enterprises and large scale state farms were privatized (Addison and Geda, 2001). Microfinance has developed well and reaches 2.4 million Ethiopians(Ageba and Amha, 2006). (MFWA) (Africa, 2016). This shows many of the steps taken in transitioning to marked based financial sector have worked. However, the financial system remains under developed. The loan markets are still mainly dominated by the state-owned Commercial Bank of Ethiopia (CBE)(Africa, 2016). Mobile banking in Ethiopia lags behind its counterparts in the sub-Saharan Africa. Stock market is totally absent in Ethiopia, while commodity exchange

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[3] https://www.mfw4a.org/ethiopia/financial-sector-profile.html#c10806

and the other financial institutions remain at the early stages of their developments (Africa, 2016, Addison and Geda, 2001, Mulupi, 15.04.2015).

Following two and half decades of reviving the financial sector, there are in total 19 commercial banks in Ethiopia (Africa, 2016). There are (3) public and (16) private banks in Ethiopia with about 1376 branches among them in 2012 (Financial inclusion, regulation and inclusive growth in Ethiopia). The banking sector is dominated by the state owned banks, while foreign banks are totally absent in Ethiopia (Addison and Geda, 2001). Even though the progress in the financial sector especially the banking sector has been encouraging in the recent history of the country, the number of households with access to the formal credit market remain limited. With only 10% of the house olds having access to the banking sector, NGOs and the government have looked for other solutions to the coverage issue (Obo, 2009).

In addition to the banks, there are various microfinance institutions, saving and credit cooperatives that are trying to solve the credit access problem of the poor. The microfinance institutions (MFIs) play a vital role in terms of credit access, saving mobilization and to some extent micro-insurance services to the excluded majority(Obo, 2009). Micro credit is source of loan(Morduch, 1999). NGOs, charity organization and other association can give micro credit. The Micro credit contains often small amount of money for a group of people that are organized in a society (Akerlof, 1995). Consequently, such system works differently given the asymmetric information problems they are facing. The asymmetric problems often occur due to lack of collateral, insurance and the risky environment they are facing(Akerlof, 1995). Under such system, some micro creditors use groups to insurance as Grameen bank in Bangladesh(Jain, 1996). While other apply another method to provide loan and repayment based on their associations.

There were 31 registered MFIs and above 8200 saving and credit cooperatives (SACCOs) in 2013 (Africa, 2016). The largescale microfinance institutions are financed and managed by governmental and non-governmental organizations (Obo, 2009). Some funds have been made available for MFIs from Development Bank of Ethiopia (DBE) with an interest rate at as low as 8.5% (Africa, 2016). As with the rest of financial sector the MFIs have made large strides since their starts in 1996 and had a total capital of about 220 million USD in 2012(Africa, 2016, Addison and Geda, 2001).

Table 2.2. The performance of MFI in USD starting in 2004 to 2013

Particulars	2004/05	2007/08	2008/09	2009/10	2010/11	2011/12	Dec. 2013
Total Capital	65.7	145.0	166.7	184.3	182.8	214.6	255.4
Saving	58.9	168.9	201.4	206.3	234.5	311.5	402.4
Credit	171.1	484.1	473.7	451.9	433.7	530.8	653.4
Total Assets	219.6	577.7	635.4	617.4	630.0	760.5	930.4

Source: NBE, Annual reports, various issues and EMFIA.

7.1 million people have access to saving accounts in the traditional banks in Ethiopia as of 2013(Africa, 2016). This makes up 8% of the total population. The picture gets grimmer when one looks at the borrowers (only 112 793). The borrowers of the banks are mainly large and old firms (Africa, 2016, Obo, 2009). The MFIs and SACCOs have tried to enhance inclusiveness in the financial market(Bayrau et al., 2013). Small and micro enterprises along with the rural population have benefited from the expansion of MFIs and SACCO (Bayrau et al., 2013, Ageba and Amha, 2006).

Table 2.2 shows the adventurous growth exhibits by the MFIs for the last decade (Bayrau et al., 2013). However, a closer look at the MFIs shows that large challenges remain with regard to inclusiveness. About 75% of total capital in the MFI is owned by four regional government owned MFIs (Amhara, Dedebit, Oromo and Omo credit and savings institution) and only 14,5% of the population of the country has coverage by the MFIs (Bayrau et al., 2013).

Excluded from the formal financial market 85% of the population seeks towards the informal market to meet their credit demands(Bayrau et al., 2013). Degfee mention the high cost of transaction linked to screening, absence of appropriate information about the borrowers and a great risk of default as reasons for the limited inclusiveness by the formal sector in Ethiopia, especially in rural areas (Obo, 2009).

For the informal market describes the transaction between neighbor and relatives to be affected by the personal familiarity of characteristic (Bardhan and Udry, 1999). In Ethiopia Degefe explains the occurrence of informal lending through iddir and iqub, community grounded funding sector (Obo, 2009). Iddir, operates as informal insurance, providing necessary social financial support in the community for management of shocks (Aredo, 1993). Iddir-related

service might occur as contribution from common money pool, support with labor, food, drinks, and comfort during grief (Obo, 2009). Degefe defines iddir as "*regularly contribution to a common poll-in- cash or kind- with a view to supporting needy members contribute to common criteria for membership*" (Obo, 2009). Iqub refers to rotating savings and credit associations, also known as Roscas (Aredo, 1993). The participators in iqub accumulate money frequently to the common pool by agreement amongst them(Aredo, 1993, Obo, 2009).

Degefe, argues that transactions among friends and relatives to account for more than the credit organized through iddir and iqub, based on the Ethiopian culture and reciprocal support (Obo, 2009). Credit attribute to the moneylenders is reported to be trivial by Degefe (Obo, 2009, Asmelash, 2003). The perception on moneylender appears to be undesirable and can be clarify through tradition value and the law in Ethiopia (Obo, 2009).

2.3   Credit constraints

Credit constraints can be explained as incidence that take place when a demanding individual are hindered from getting credit. Reasoning for constrained might appear as discouragement for approach of creditors and lack of creditors. The probability of being constrained in Ethiopia can be predicted to be higher among rural areas and poor household (Freeman et al., 1998). According to previous studies several factors such as transaction cost, default rate, infrastructure and limited access to credit have be mentioned as reasoning for credit constraint's in Ethiopia. Kertu (Kertu: 2007), reports the lack of access and efficiency among the lenders to cause inflexible loans and not reaching the vulnerable (rural) residence.

Efficient training on financial management for the borrowers can effectivities the transaction of credit. Further, it might also reduce the high default rate that Werku (Werku: 2010) reports occurs in Ethiopia. The access for creditors have been mentioned as scares (Gobezie, 2005). These can be explained by poor infrastructure, which leaves residence in poorer providence out of the credit market. The distance between the lenders and borrowers might affect the psychical approach and rise the transaction cost. Secondly, most of bank services occur in urban areas leaving other residence out (Gobezi, 2005). Most of the residence that are left out of credit service can be highly presented by rural population. Overall barriers on access for credit is reported to affect the growth and productivity negatively (Bashir et el, 2010).

3 Chapter

3.1 Data and methodology

This thesis is carried out using the Ethiopia Socio-economic survey (ESS). The survey is conducted by the Central Statistics Agency of Ethiopia (CSA) in collaboration with the World Bank Living Standard Measurement Study-Integrate Survey of Agriculture (LSMS-ISA). The data collection is funded by the Bill and Melinda gates foundation, and is intended to provide high quality household data for evidence-based policymaking.

ESS is a panel survey that contains data about human capital, economic activities and access to different resources and services in households mainly engaging in agricultural activities. Unlike its predecessor (Ethiopian rural socioeconomic survey (ERSS)), ESS contains data from the urban areas in addition to the rural population. There are total of 433 enumeration areas (EA)[4] represented in the survey with 290 from rural areas, 43 from small towns and the rest from major urban areas. The EA are spread evenly across the 9 regional states and the two chartered cities weighted by population, and contain data from 15 households each. The survey is thus designed and conducted to be representative of the entire country. Sampling design were selected by multi-stage, cluster design. Table 3.1 shows the distribution of the EAs. Further, sample of household by zone and region is presented in appendix c as table 3.1.

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[4] *Enumeration Area: Is the smallest geographical unit (piece of land) into which the country is divided for census or survey enumeration.*

Table 3-1 Sample design from ESS

	Total EAs	Rural EAs	Urban	
			Small town EAs	Mid and Large Town EAs
National	433	290	43	100
Regions				
Tigray	49	30	4	15
Afar	13	10	2	1
Amhara	86	61	10	15
Oromiya	85	55	10	20
Somali	26	20	3	3
Benishangul-Gumuz	11	10	1	0
SNNP	99	74	10	15
Gambela	12	10	1	1
Harari	14	10	1	3
Dire Dawa	18	10	1	7
Addis Ababa	20	NA	NA	20

Source: From ESS

With the intension of improving the data quality the majority of the field staff employed for the ERSS were also employed for the ESS. The staff received further training on various occasion by the CSA and World Bank. Further, household that were interviewed in ERSS were re-interviewed for the ESS. The data set in its earlier version have been used to conduct research covering topics such as Migration in Ethiopia, effect of remittance and poverty analysis in urban Ethiopia.

The survey is collected by visiting scheduled households for an in depth interviews. In various literatures, this method is referred to as direct method since direct contact with the "subject" is made to obtain the first-hand information. The expansion from ERSS enables the new project with broader information by including samples from all regions and urban areas. ESS were conducted in three increments. First round was concluded in October of 2013, where it composed data on post-planting agriculture activities. Second round took place in November & December 2013 and gathered information about livestock. The last & third round consists of gathering data about household, post-harvest agriculture and community in February and April 2014. The new setting with ESS is the capacity to monitor the same household overtime. This makes it possible to follow household's decision-making process under changing circumstances and as unforeseen events occurs.

Table 3.2 portray how the files in the data set are build. The files are divided in five categories covering household, community, post-planting and post-harvest questionnaires. For this research we focus on questionnaires from the household category. Diverse information about the households are given in different categories. The setups for household categories are portrayed in the table 3.2.

Table 3.2 Present files for ESS questionnaires

	Questionnaires
Household	Demographics, education, health, labor, food and non-food expenditure, food security, shock, assets and credit
Community	Infrastructure, community organization, resource management, changes in the community & local retail price information
Post-planting & post-harvest agriculture	Farm labor, inputs use, GPS land area measurement, agriculture capital, irrigation, crop harvest and utilization
Livestock	Animal holdings and costs, production, cost & sales of livestock byproducts

Source: from ESS-survey

The data set provides this study with rich and valuable measurements about the various types of households. ESS data set contains characteristic of household in form of the social, behavioral, demographic, commodity, livestock, economical and more. In addition, the survey contains detailed information about housing financial situation, such as income, credit and assets.

3.2 Methodology

As indicated in the objective of this research, our purpose is to evaluate credit constrained household. This section explains the methods used to identify the broad participation in credit market, provided by the ESS. In addition, description of how credit constraints household are identified is explained. The model chosen here is taken in the basis of the ability to express the relationship between the variables used to evaluate household.

3.3 Direct and indirect approach

Two approaches have been used as empirical methodologies to identify credit constraints. These approaches are called direct and indirect approach. Indirect approach have been explained as procedure to determinants credit constraints based on analysis of permanent theory developed by Milton Friedman (Diagne et al., 2000). Consumption smoothing is thought to be the main driving force behind the credit demand in this approach. Large data set is reported to be needed to carry out the indirect approach (Love and Sánchez, 2009).Further, throughout their life cycle household maximizes utility by saving under high transitory revenue and borrows during low transitory income (Diagne et al., 2000). Diagne, further indicate that indirect approach assumes with diminishing marginal utility, in the lack of access and demand constraints((Diagne et al., 2000)). Several studies such as Paulson and Townsend ((Paulson and Townsend, 2001) and Guiso (Guiso, 1998); cited by Love & Sanchez), have been conducted using these method.

Direct approach is the methodology used in this thesis. This method captures information directly from the households by interviewing them. The practice of direct approach solves the problem with disequilibrium models, while a problem arises with quantifying the level of credit constraints of the households in question (Love and Sánchez, 2009). The qualitative nature of the data makes it challenging to measure to which extent the households are credit constrained. The questionnaires in the ESS ask whether a household has applied for and received credit. This does not answer if the households demand for credit was fully or partially met. It is thus difficult to conclude if households that have received loans are not credit constrained, as they can be partially credit constrained.

ESS survey contributes to study the extent of credit constraints and the overall demand. Using the responses to different questions, the identification of divers household are analyzed. This identification occurs by first observing household that have applied and those who did not. First, we study the reasoning for not applying. In this case there were household that respond to not having the need for credit. In addition, household that were discouraged to apply (potential borrowers) were found. Second, for those household that applied, the responded were categorized as received and rejected. Overall, household are categorized in four groups; no demand, discouraged (credit constraints), received and rejected (credit constraints).

No demand: The decision to apply depends on whether the household member has a demand for credit or not. Household in *no demand* category have not applied. This group contains of household with the following respond from ESS; 1) Have an adequate farm.

All other reasoning for not applying is summarized to identify the second and (*discouraged*) credit constrained group. This group are detached from overall household that did not apply based on their answer that were discouragement. Household in this category is defined as credit constrained, since they indicate to have demand but also were discouraged to apply. Several of the respond from discouraged (credit constrained) household indicate to have inadequate information on procedure of credit application. The lack of knowledge on how and who to approach to, hinders portion of credit constrained household from applying. These might arise as result of absence of local lenders. Meaning lenders are not positioned closer to household. In addition, that household perceive the cost of expected default to be higher than the benefit of the loan, might rise discouragement. The risk of losing collateral such as house or other valuable asset can be viewed as less esteemed then the benefits occurring through loan. Perception of not being creditworthy by lenders are another barrier that prevents household from demanding credit. These can occur as result of having inadequate collateral and by fear of rejection.

Third group contains all household that *applied and received*. While the fourth group identifies household that *applied but were rejected*. This group are also consider as credit constrained. Henceforward, credit constrained group are merged representative of household that did not apply because of discouragement and those that applied and were rejected. By such classification, the regression analysis of participation in loan market focuses on three outcome. First outcome, present household with no need for credit (no demand). Second outcome,

contains household that were credit constrained. Outcome represents household that received credit. In addition, presentation of lenders are distinguished as formal and informal. For the regression analysis, the probit regression with sample selection model is applied.

For the descriptive analysis household are divided in two, where they are categorized based on their request for loan. For the respond *no,* the options are divide by *no demand* and *discouraged.* Those who answered *yes* were further grouped based on which institution they received credit from as, formal and informal.

3.4   The Model:

The focus of the following section turns towards understanding the conditions surrounding supply and demand of credit in the dataset provided for this study. In order to comprehend what role the various variables play in determining who becomes credit constrained a binary model is constructed. Following in Love & Sanchez (Love and Sánchez, 2009) footsteps the study of formal and informal market is implemented separately at first. Then, the model was further implemented on the combined (formal and informal) data.

For this study, the model chosen is bivariate probit regression with sample selection. This model have been used in other research such as Kapland and Venezeky(Kaplan and Venezky, 1994). Sample selection is reported to refers to sample not randomly selected ((Guo and Fraser, 2014), chapter 4, page 85-125). The correct solution for problem of selection bias is reported to originate from Heckman`s two-stage estimation in 1979(Kaplan and Venezky, 1994). In his work from 1979 example are provided on how selection bias can be correctly approached (Heckman, 1979).

Maximum likelihood present log-likelihood functions in its estimations. Besides, maximum likelihood were also reported to be more robust conducting the two-stage estimation (Greene and Hensher, 2010, Greene and Hensher, 2008). By such reasoning, these study performer's maximum likelihood estimation. Bivariate probit regression with sample selectin is estimated in Stata by heckprobit as maximum likelihood procedure. Within this estimation, Stata presents goodness-of-fit measurements in form of Rho, Sigma and lamda. *Rho* contains estimation of correlation of the residuals in the two equation. *Sigma* estimates the standard error of residuals. *Lambda* here is the result of sigma multiplied by rho and it also contains the inverse mills ratio ((Menu) Stata).

By the use of bivariate probit regression with sample selection, the procedure is divide into demand and access estimation with binary variables (0/1). Demand and access equations are estimated jointly for this research (Love and Sánchez, 2009). This was done in two main increments. The parameters are estimated by the likelihood method, using bivariate Probit model with sample selection. The first stage of this process determinates whether there is demand for credit in a household exists or not. Equation 1 assigns a binary value to a household depending on the demand for credit. In addition, it is used to control the endogenous self-selection procedure in determining demand for credit and contains also probability prediction through probit model (Love and Sánchez, 2009).   The second part of the process evaluates the

access for credit provided there is demand for credit. Households with no demand for credit are left out based on the binary values assigned in step one (i.e. equation 1). Equation 2, also known as the access equation is applied to the rest of the households. Here the lenders decide whether to approve the loan application or not. Further, inverse Mills ratio (IMS) is included as regression for the estimation (Kaplan and Venezky, 1994).

Sampling law: $y_D = 1 \ if \ and \ only \ if \ D > 0, and \ 0 \ else$

$y_A \ are \ only \ observed \ if \ D = 1$

Inver mills ratio: $\lambda_i = \dfrac{\phi(\beta_1 X_D + \beta_2 Z_{D)}}{\Phi(\beta_{1X_D} + \beta_2 Z_{D)}},$

Φ is the density normal function,

ϕ is cumulative normal functions

$y_D = Demand, \qquad y_A = Access$

The sample passed through the access equation in step 2 is no longer randomly selected since the only households included are the households with the right (1) binary values (demand credit). This makes the data to be "selected" by systematic process (Kaplan and Venezky, 1994) Bivariate sample selection account for this problem, where first probit model is estimated for explaining if household are demanding and not. Further, least square regression is estimated relating household with demand to explanatory variables and inverse Mills ratio (Kaplan and Venezky, 1994). Inverse Mills ration (IMR) is expected to be further modified the access equation (2), giving sample regression function through estimation of covariance divided by variance of the demand (Kaplan and Venezky, 1994). The role of IMR as to fulfil the assumption of zero in the conditional mean of error, so the estimation not end up as bias (Kaplan and Venezky, 1994).

Selectivity: $[\mu_D, \mu_A] \sim N_2[0,0,1,1,\rho_{\mu_D,\mu_A}]$

Covariance matrix: $\begin{bmatrix} \sigma_i^2 & \rho \\ \rho & 1 \end{bmatrix}$

$$\mu_i = 0, \quad and \quad \sigma_i^2 = 1$$

Error term in these two equations are assumed to have jointly normal distribution(Kaplan and Venezky, 1994). Since only the sign of demand is observed and σ is unknown, the normalization σ_i^2=1 is used (Beyene, 2014). If $\sigma_i^2 = 0$ the error terms in demand and access equation are not correlated.

f(y)D={0 if D<0 |1 if D≥0 , f(y)A={0, if A<0 |1 if A≥0

(1) $y_D = \beta_1 x_D + \beta_2 Z_D + \mu_D$

(2) $y_A = \beta_1 x_A + \mu_A$

y_A is observed only when demand occurs, y_D =1

Equation (1) indicate the demand function, while equation (2) present the access. Identification requires, there should be at least one variable included in the demand equation, but not in the access equation (Beyene, 2014). For this study, Z from equation (1) explains the framework for the "additional variable" From the equation (1) X refers to explanatory variable and μ_i is disturbance term. Diverse variable categories elaborates to control for household heterogeneity.

3.5   Variables: Description

This section describes, the variables used in the estimation of the demand and access equation are described. These variables are categorized in four groups, namely: household characteristics; household head (personal) characteristics; demographic; and additional variable (demand identification). The last mentioned variable is only to be found in the demand equation. In appendix C, table c.3 shows the list of all the variables along with their mean and standard deviation.

The first group of variable set includes household characteristic. Such characteristics contain variables such as size of household (in term of how many members' lives in the household). A variable that depends on the size of a household may affect the consumption or income of the household. If the Size of a household is small, it may indicates less consumption or income and vice-verse. Number of children accounts for the expenses related to having children. It may also lead to increased income as a result of increase in the working force of the family. That in turn could affect the households chance of getting a loan. Numbers of adult are also consider by assumption as income resource and also the expense that occurs with it.

Second set of variables contains personal characteristic of the "head" of the household that may influence the demand and supply of credit. Education can be used to reflect the ability of the head of the household and their expected future income as mentioned by Ibrahim (Ibrahim et al., 2007). For head of a household that have not had access to education the assumption/literature indicate that formal lenders might view this as barrier. Gender in developing countries is thought to affect through the barriers of lacking network and discrimination. Moreover, characteristics such as owning non-agriculture enterprise and owning house are also included. These could estimate the value of owning asset on demanding and receiving of credit.

To capture the difference economic condition through the region, we include all eleven regions. This can be used to estimate how different region are "equipped" to meet the demand and supply of credit of its residents. Furthermore, it could give valuable information on how the local credit market operates, and whether location of the applicant affects the outcome of the application or not.

"Additional variable" are assumed only to entre in the selection equation. This assumption is based on some characteristic that are unobserved by the lenders, but are likely to correlate with demand (Love and Sánchez, 2009). Since this identification is unobservable to the lenders, it is assumed to not affect the lenders decision on granting or denying the loan. For these additional explanatory variables, we consider possible reasons for applying for loan, such as adverse occasions. The identification focuses on such outcomes as death or illness of member of household, loss of income, climate change (such as drought), price change on commodity, shock or accident on member of the household and other outcomes that increase the demand for loan. Mentioned indicators in the additional variable might in general increases the need for funds to cover the cost involved when such adverse event occurs.

4 Chapter

4.1 Results

In this chapter the results found for the formal market and the informal markets are presented separately, followed by the overall performance on determinants of credit constrained for both markets combined. The descriptive analysis follows the questionnaires raised from the survey. Meaning, it describes the decision household have taken based on the respond from the questionnaires. Whereas if household do have demand, were the credit received from formal or informal? In addition, it considers also household with no need for credit and those who are discouraged to borrow. The result from bivariate Probit model with sample selection in reported in table 4.4, 4.6 & 4.7.

4.2 Lenders

The ESS data set contains information about who the surveyed households approached for loans in the credit markets. The data available gives a detailed account of the institutions and parties the various households had the opportunity to ask. The results are presented in figure 4.1.The survey indicate credit constraints to occur more in formal rather than informal. From the formal lenders except for micro finance the incidence of credit constraint among lenders neutrally consist. The same occur for the informal lender also, with exception for neighbor and relatives. These incidence might indicate that microfinance, neighbor and relatives to be easily approached and located in accessible areas for the households.

Figure 4-1 Source of credit

Institution demand application was made for

■ Institution demand application was made for

Realtive: 0,301
Neighbour: 0,168
Grocery/local merchant: 0,053
Money lender: 0,027
Employer: 0,039
Microfinance institution: 0,292
Bank(commercial): 0,044
NGO: 0,027
other (specify): 0,049
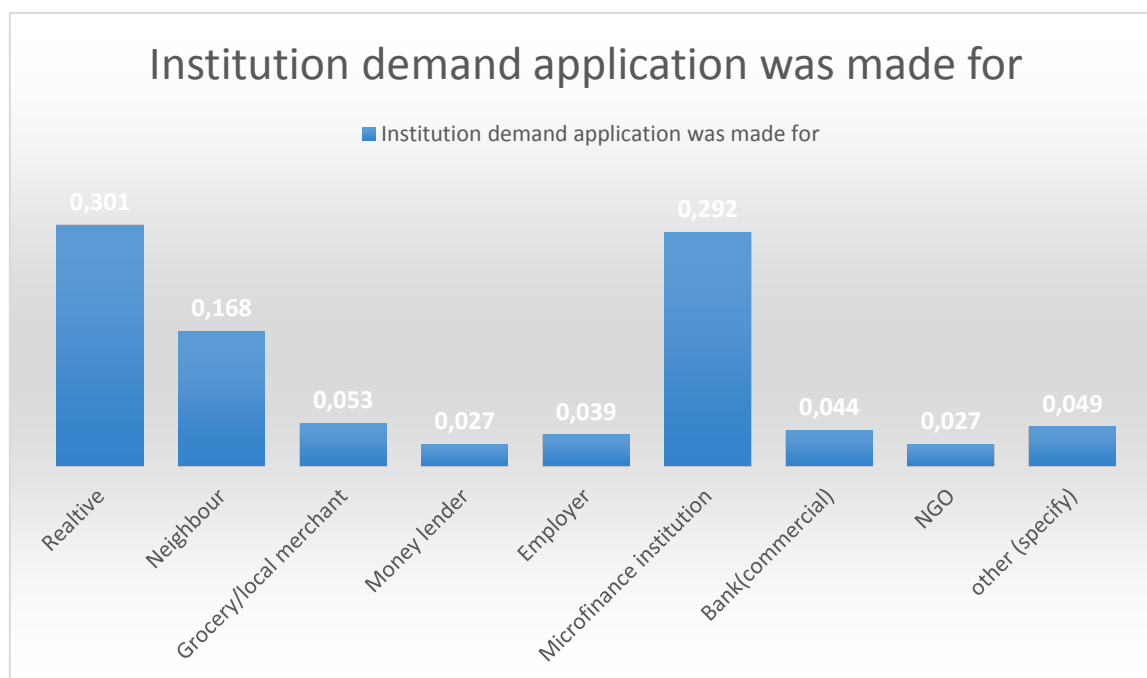
Source: authors calculation form ESS 2013

Figure 4.1 shows the lenders of those 1 333 credit across the country. As mentioned earlier the credit market operates with formal and informal lenders. Informal suppliers cover 60 percent of the transaction, while formal lenders cover the remaining 40 percent. From the formal lenders, microfinance institutions are found to be the highest distributer of credit, (with 29 percent). This result confirm the great role microfinance institutions play in inclusion of the broad population in to the financial markets. Second largest formal creditors are Commercial Bank of Ethiopia. While approaching the NGOs for a loan ranks in third place. For the informal lenders most of credit transaction arises between households and relative. Meaning, the largest distributer of informal credit is relative. Besides loans from a relative, money transactions between neighbors are also reported to be following highest distributer of informal credit. Local merchant, moneylender, employer and other non-governmental lender, (respectively) present the rest of creditor from informal institution.

There can be several reasons for approaching one of the creditors than the other. The preference of some lenders ahead of others can be explained by for instance the accessibility of the lender, cost of the loan, the purpose of the loan and the preference of the borrower. Purpose of

borrowing might occur as consumption smoothing, investment or covering an adverse event. Preference can indicate the personal relation and the access one have towards these institutions.

4.3   Borrowers:

Borrowers consists of those whom receive valuable assents on agreement or promise on paying the borrowed amount back in given time and cost related (Kon and Storey, 2003, Hodgman, 1960). Households are separated as credit borrowers and non-borrowers. ESS provides also some information on why the borrowers enter and remain away from the loan market. Figure 4.2 presents the summative result for non-borrowing households.

Figure 4-2 Reasons for not borrowing
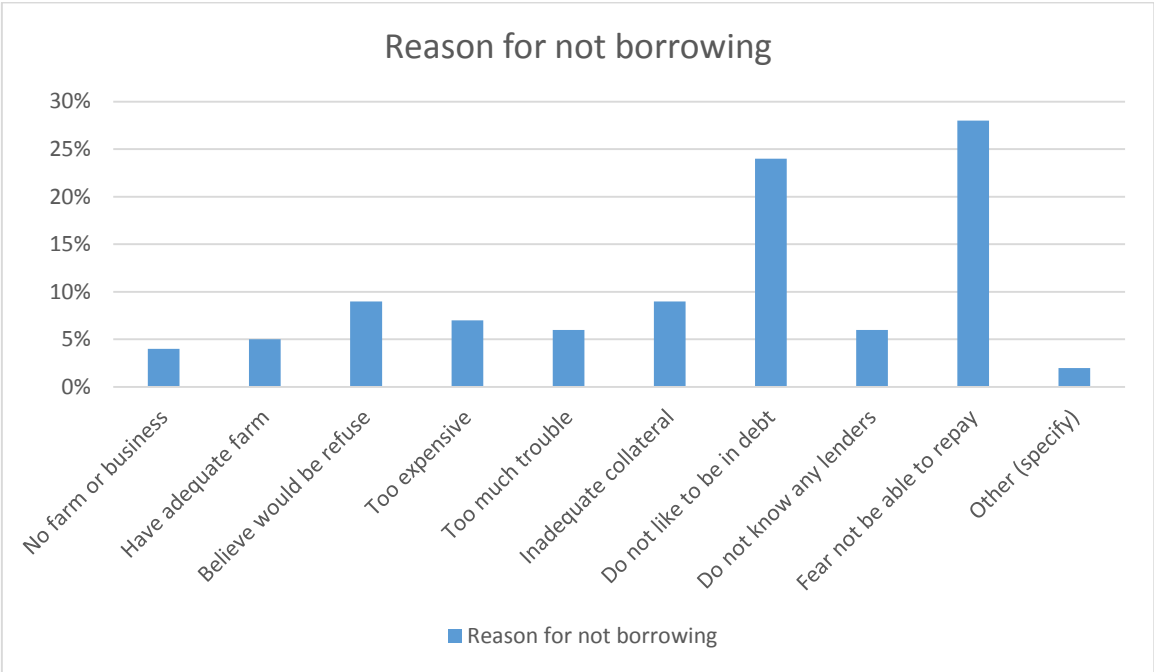
Source: authors calculation form ESS 2013

The aggregate result includes also household with no need for credit. The sum of household with no need for credit represent small fraction of the households that participated in the ESS survey. Household with such position respond to be relying on their own resources. Overall, household with such reasoning and discourage to borrow are viewed as non-borrowers. Further, the discourage household are consider to be credit constrained, as mentioned in the earlier chapter (3).

Figure 4-3 Reason for borrowing
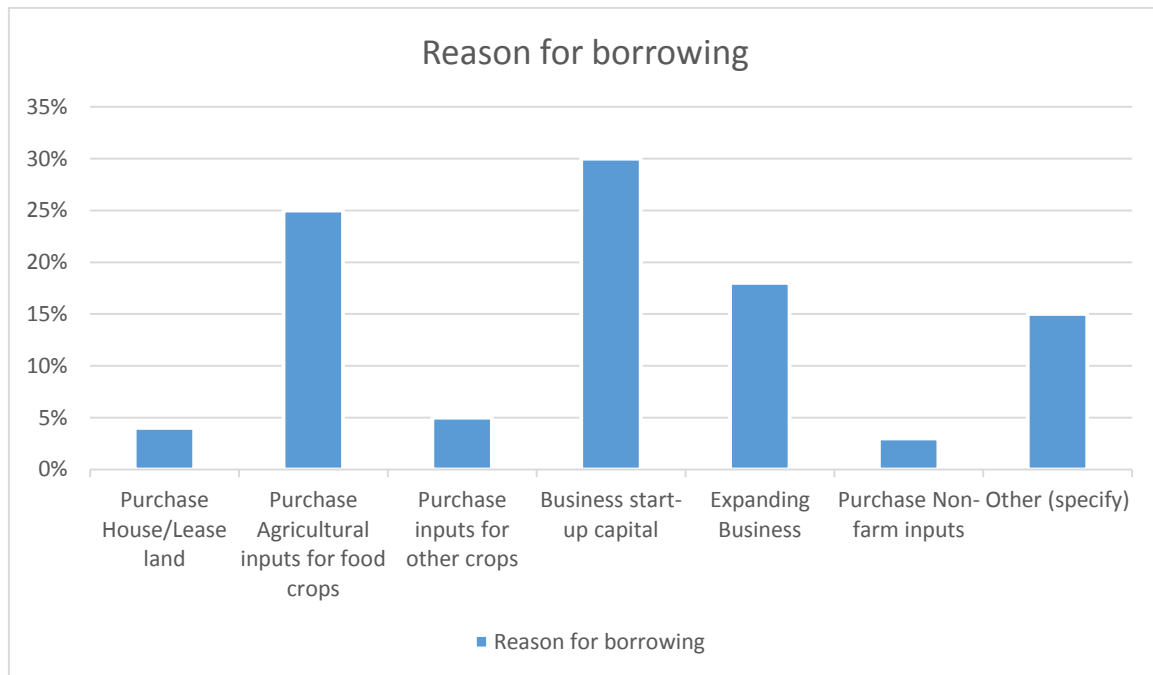
Source: authors calculation form ESS 2013

The various reasons the borrower's asked for credit is portrayed in figure 4.3. The borrowers mostly require credit as start-up capital for opening businesses. These might be partially explained by the countries large agriculture activity and need of inputs to effectives the productivity(Dercon and Hill, 2009). The second most frequent reason for a borrower to approach a lender is for consumption of agricultural input for food crops. Expanding business is also another motive that raise the demand for credit. Other (specify) from figure 4.3 includes the need for credit, to purchase oxen for farming, household consumption, construction of a house and to start livestock fattening. The rest are covered by borrower with the need for consumption of inputs for other crops, purchase of non-farm inputs and purchase of house or lease land.

Received credit from formal & informal sector
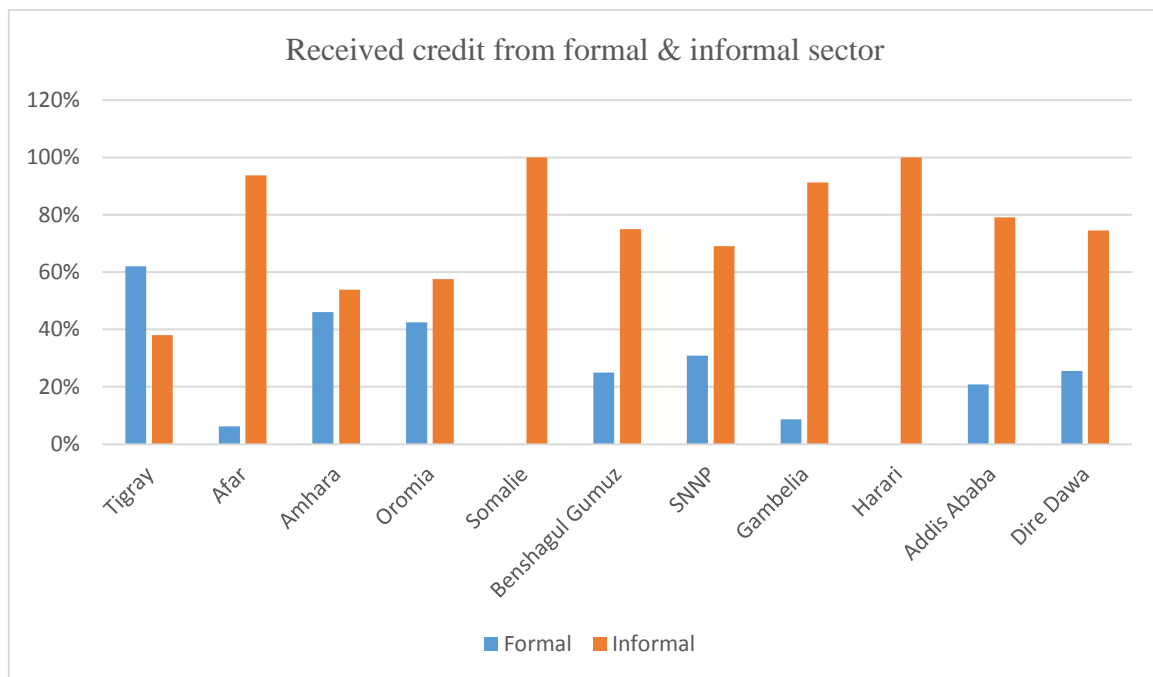
Source: author's calculation by the use of ESS

4.4 Formal

The focus of this section shifts towards the results obtained from the data about the formal credit markets. As mentioned earlier formal institution for this study contains microfinance, Commercial banks and NGO`s. Characteristics that affect borrower and formal lenders are studied closer. The following issues are the core problems discussed further. Which features do borrowers demanding from formal institutions have? What kind of borrowers are credit constrained from these formal institutions? Which features increase the likelihood of receiving credit form formal lenders?

4.4.1 Who demands?

The number of people in a given household is referred to as the household size. A given household can have several adult members besides the household head. The size of a household is not statically significant in the result achieved by the regression. The study of the descriptive estimation on size is reported in table 4.4. Table 4.4, presents subgroups household size and the result associated with variable of size. The purpose of such groupings are to provide information on the effect household dimension have on the probability of the approval of their application for credit.

Table 4-1 Subgroups of household family size

	Have you borrowed on credit?				Total
	Yes		No		
	Formal	Informal	No need	Discouraged	
Size: 1-2	7 %	14 %	11 %	68 %	980
Size: 3-4	9 %	16 %	10 %	65 %	1442
Size: 5-6	12 %	16 %	9 %	63 %	1373
Size: 7-8	15 %	15 %	9 %	61%	912
Size: 9 and above	12 %	15%	10 %	63%	458
Total	534	799	515	3318	5165

Source: author's calculation by the use of ESS.

Households with 3-4 and 5-6 member's accounts for over half of the share in the data set by representation of 28% and 27 % respectively. Meaning, most of the participators in ESS have 3 to 6 family member living in one household. The data indicates that 7-8 family members to receives more credit from the formal institutions than the others. The larger group that contains higher probability of being credit constrain though discouragement are those with small (1-2) sized household.

The data presented on table 4.4 shows also that demand for credit is somewhat proportional with the number of members in a household. Meaning, small sized household are the once with the least demand for credit from the formal market. Furthermore, the smallest households are the most discouraged from approaching the loan market for credit. For the formal market higher probability of receiving occurs for household with large member. Small sized family member appears to receive more from informal market.

Personal characteristics such as the following variables determinants the likelihood of a household demanding credit in the formal institutions.

Male demand 12.9 percent more from formal market than women according to the regression analyze.

Households lacking in educated tend to have statically higher probability of demanding from the formal institutions.

Likelihood of households demanding capital in formal markets decrease for the household that do not own their house. Owning non-agricultural enterprise and owning a house, are variables that affect the demand in this sector. Collateral can be partial explanation of this incident.

Age indicate reduced demand from younger (under 29) and older (above 60) participators. Middle-age "head" are likely to demand credit in formal market by 13.6%.

The statistical analysis undertaken in this study shows there are major variations between the regional states. There is statistical significance in the regional states of Tigray and SNNP. In aforementioned states there tends to be a higher demand for credit from the formal sector, while the opposite is true in the capital city Addis Ababa, Afar and Harari regions. Moreover the descriptive analysis revels that Somalia and Gambela are also less likely to demand from formal creditors. Participators from these two areas were not able to receive any credit from the formal

market. On the other hand, the Amhara and Oromia regions appear to have higher demand from the formal market when the descriptive analysis is examined.

In Ethiopia large proportion of the population depend immensely on agricultural outcome for their economic safety and wellbeing. This often leads to an increase in demand for credit as a result of unpredictable climate change, commodity price and other shocks and accidents in the economy overall. Droughts and deregulation have become more frequent due to climate change. This in turn leads to an increased need of financial services such as loan and insurance markets. The probability of demanding credit increases as a result of that. Further, adverse event such as price change on commodity items and accident occurring on one of the household members increases the likelihood of demand in both formal markets and also informal markets.

4.4.2   Who is credit constrained:

Households that lack collateral are according to regression discriminated by the formal credit markets. Such households often lack houses, ownership of enterprises, and tend to have higher likelihood of being credit constrained. Households that lack future plans of opening business enterprises are also credit constrained in the formal credit markets. Participators that rents out house are less likely to demand credit. In addition, those who own their house have higher probability of being less credit constrained.

Gender inequality plays great role in Ethiopia in many aspects. This effect is also found in the formal credit market according to the data analysis performed in this study. Household with female head are often discriminated and more likely to be credit constrained in the formal market. Household with female heads have 19 percent higher likelihood of being credit constrained in the formal markets.

Another variable that affects ones chances of inclusion in the formal credit market is age. Age has a negative effect on the incidences of credit constraints. These can be interpreted as the middle age participator of being less credit constrained with inverted u-shape in the formal institutions. Participators in the end of this inverted u-shape are more likely to be credit constrained. Meaning, younger and old head of household are more likely to be credit constrained.

The level of education the head of the household has received is another factor that affects the demand for credit. In this thesis the base of no education includes illiterate and informally educated household heads. Compared to head without education, educated household head demand less credit from the formal institution.

For the explanation of credit constrained household characteristics such as size and number of children, were not found statically significant. However, household with small number of members have higher likelihood of being credit constrained, shown from the descriptive analyze in table 4.3.

Without any prior criterion, Tigray were chosen as the base for treatment of region variables. Compared to Tigray, residence in Harari, Addis Ababa and Dire Dawa have significantly demand of credit from the formal institution. There is non-significant disparity in the remaining regions demanding of credit. All regions are statically credit constrained when Tigray is omitted. In addition, the surprise insignificant value is found in Gambela and Harari, which were found to be caused by none-existing formal institution in these two regional states. These result were achieved through descriptive calculation for regions, it is founded in table 5.5.

Table 4-2 Demographic dispersion of credit

	Have you borrowed on credit?			
	Yes		No	
	Formal	Informal	No need	Discouraged
Tigray	28 %	12 %	9 %	51 %
Afar	0.80 %	12 %	19 %	68.2 %
Amhara	16 %	17 %	10 %	57 %
Oromia	11 %	14 %	8 %	67 %
Somalie	0 %	18 %	8 %	74 %
Benshangul Gumzu	5 %	14 %	13 %	68 %
SNNP	7 %	16 %	6 %	71 %
Gambelia	2 %	18 %	10 %	70 %
Harari	0 %	13 %	27 %	60 %
Addis Ababa	2 %	7 %	23 %	68 %
Dire Dawa	6 %	17 %	13 %	64 %
Total	10 %	16 %	10 %	64 %

Source: author's calculation from ESS

The data set specifies the difference in distribution credit through all of the eleven regions.
Table 4.5 displays how the dispersion appears across the country.

4.4.3 Who receive?

Features associated with the likelihood of being able to receive credit from formal lenders are:

Middle-age participators are more likely to receive a loan in the formal markets than the younger and older applicants are. It can be their future expectation and to smooth the barriers to get capital for starting up of diverse businesses plans.

Those who approach the credit markets with this strategy have increased the probability of getting credit from formal market.

The ownership of a house increases the probability of receiving a loan from the formal markets, provided the house presented as collateral. In addition, it can create positive perception of the borrowers. The probability of getting credit increases by 32.2 % for household with their own houses. Owning asset may explained as risk adjustment system implied by the formal institution.

Male participators are more likely of getting credit in formal market.

The level of education obtained by the head of the household did not affect the probability of getting credit. Meaning, the formal institution provides credit for household heads that have illiterate and primary education. These can be clarify by some formal market (especially microfinance) servicing resident that are more vulnerable.

To clarify the descriptive and econometric relationship between age and credit, age of the head and its square is used as explanatory variables. Table 4.3 shows composition of borrower's choice based on given group-age of the head.

Table 4-3 Age dispersion of credit

| | Have you borrowed on credit? | | | | Total participators= 5165 |
| | Yes | | No | | |
	Formal	Informal	No need	Discouraged	
1 (under 29)	5 %	16 %	11 %	68 %	947
2 (30-44 age)	11 %	17 %	9 %	63 %	1952
3 (45-59 age)	12 %	14 %	10 %	64 %	1281
4 (above 60)	10%	15 %	11 %	64 %	985

Source: author's calculation from ESS 2013

Initially, the middle age household head have the higher benefit of receiving credit in formal institution. From Table 4.3, it can be observed that the majority of household heads are middle aged. Totally the group of individuals under 29 are lowest represented and those who receive the least. Further, the variation contribute an overview of vulnerability to be found in each age group encounter with credit market. The youngest participators are according to presented table most exposed of being credit constrained form formal institution.

The descriptive analyze contribute further explanation occurring in different regions. Residence form areas such as Tigray, Ahmara, Oromia and SNNP have higher probability receiving form formal institution.

4.4.4 The results of regression analysis for the formal sector

Table 4.4: Regression result for formal sector

| | ML-estimation | | | | | |
| | Demand | | Formal Credit constrained | | Received | |
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Household characteristics						
Numbers of childeren	0,201	0,728	0,006	0,848	-0,034	0,485
Numbers of adults	-0,002	0,967	0,022	0,557	-0,055	0,272
(Household size)	-0,0107	0,853	-0,028	0,451	0,069	0,145
Personal characteristics						
Age	0,014	0,136	-0,008	0,191	0,025	0,022
Age square/100	-0,015	0,09	0,008	0,192	-0,022	0,031
Gender (male)	-0,124	0,028	-0,192	0	0,287	0,000
Own non-agric entrepr.	-0,107	0,145	-0,165	0,004	0,083	0,306
Education	-0,168	0,002	-0,033	0,322	-0,034	0,553
Plan to open business	-0,057	0,32	-0,212	0	0,142	0,016
Owning a house/dwelling	-0,177	0,078	-0,182	0,01	0,321	0,004
Regional characteristics						
Afar	-0,589	0,000	0,482	0,000	-1,781	0,000
Amhara	-0,04	0,664	0,145	0,022	-0,399	0,000
Oromia	0,075	0,421	0,452	0,000	-0,673	0,000
Somalie	-0,143	0,315	0,66	0,000	-7,721	1
Benshagul Gumuz	-0,166	0,307	0,535	0,000	-1,13	0,000
SNNP	0,259	0,008	0,582	0,000	-0,961	0,000
Gambelia	0,017	0,922	0,542	0,000	-1,481	0,000
Harari	-0,782	0,000	0,232	0,040	-7,96	1
Addis Ababa	-0,649	0,000	0,38	0,000	-1,128	0,000
Dire Dawa	-0,268	0,051	0,382	0,001	-0,925	0,000
Demand identification						
Death or illness	0,099	0,421				
Loss of income	0,53	0,249				
Affected by climatic events	0,265	0,002				
Price change on food	0,269	0,006				
Shock/accicdent	0,225	0,003				
Other	0,096	0,592				
constant	1,364	0,000	0,649	0	-1,647	0

Significant at * 1%, ** 5%, *** 10%

Wald chi2(21)=246 with prob > chi2=0.000, rho= -0.304, atrho=-0.314, LR test chi2(1)= 0.80 with prob > chi2=0.369

4.5 Informal

4.5.1 Who demands?

Households with educated heads appear to demand more credit from informal market than the other groups. Educated head are 16 percent more likely to demand credits than their counterpart that are not educated. Male participators demand by 12 percent more than female.

For the regional fragment holding Tigray as the base, several more areas demand credit from informal institution. Afar, SNNP, Addis Ababa and Harari have significantly higher probability for demanding from informal. The lack of formal institution in Gambella and Harari increases the probability of demand in informal institution. These is also shown in the descriptive analysis of region in table 4.2.

Table 4-5 Descriptive analyze of gender and education for head of households

Have you borrowed on credit?				
Yes			No	
	Formal	Informal	No need	Discouraged
Female	7 %	15 %	9 %	69 %
Male	12 %	16 %	10 %	62 %
No education	12 %	16 %	8 %	64 %
Primary	10 %	16 %	9 %	65 %
Secondary	6 %	16 %	14 %	64 %
Degree/certificates	7 %	14 %	16 %	63 %

Source: author's calculation from ESS 2013

The gender based description is provided by table 4.7. It describe that 70 % of participation to be male. Remaining 30 % are covered by female, accounting for 1 568 participators. These might indicate female to be more vulnerable than their male counter parts. Almost double as many male receive credit from formal institution than their female counterpart. The difference

in informal market is less as shown in the table 5.7. In total female head can be seen as of being more credit constrained.

4.5.2 Who is credit constrained:

Female are about 19 percent more likely to be credit constrained in informal market. Love & Sanchez clarify this occurrence by the traditional and cultural barriers that might be occurring in developing economy.

The probability of being credit constrained increases where asset such as house are rented and not owned by the head of household. Household that rent a house are about 12 percent more likely to be credit constrained in the informal market. These resemble with household that own non-agriculture enterprise. Owning your own business decreases the likelihood of being credit constrained. Plan to open business decreases the occurrence of being credit constrained in both formal and informal lenders decision.

The propensity of being credit constrained in other region than Tigray are high according to the regression. These outcomes are the same both for formal and informal market.

4.5.3 Who receive?

Household that borrows from informal have such characteristic:

The level of education of the household head leads to increase in the probability of getting credit from informal by 8 %. This indicates that education have a financial value in the society (meaning they consider those with education as more "reliable"). Also it can be measured as future proxy in this market as Ibrahim reported (Ibrahim et al., 2007).

Male are more likely to receive a loan in the informal market than female. This incidence occurs in both markets and it is also that they are less credit constrained.

Economical strategy such as o*wning non-agriculture enterprise* and *plan to open business* increases the likelihood of receiving credit.

The availability of credit in the informal market varies considerably in the various regional states. There are far more regions that have significantly high probability of receiving credit from informal institution. Residents in regions such as Afar, Amhara, Harari, Addis Ababa and Dire Dawa are more likely to get credit from the informal market than their peers in other regions.

From the "additional variable" the same variables as found for formal; climate change, price change and shock or accident, increases the likelihood of receiving credit.

4.5.4 The results of regression analysis for the informal sector

Table 4.6: Regression result for informal sector

| | ML-estimation | | | | | |
| | Demand | | Informal Credit constrained | | Received | |
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Household characteristics						
Numbers of childeren	0,007	0,91	0,0103	0,801	0,014	0,74
Numbers of adults	-0,018	0,775	0,024	0,56	0,003	0,934
(Household size)	0,006	0,918	-0,319	0,427	-0,007	0,856
Personal characteristics						
Age	0,0111	0,227	-0,009	0,186	-0,001	0,88
Age square/100	-0,013	0,141	0,009	0,182	0,0008	0,913
Gender (male)	-0,153	0,005	-0,198	0,000	0,091	0,032
Own non-agric entrepr.	-0,099	0,156	-0,175	0,002	0,167	0,004
Education	-0,172	0,001	-0,045	0,254	0,085	0,04
Plan to open business	-0,06	0,281	-0,226	0,000	0,18	0,000
Owning a house/dwelling	-0,121	0,211	-0,189	0,009	0,067	0,373
Regional characteristics						
Afar	-0,61	0,000	0,503	0,000	0,223	0,089
Amhara	-0,045	0,616	0,147	0,024	0,15	0,033
Oromia	0,059	0,522	0,456	0,000	-0,055	0,44
Somalie	-0,073	0,587	0,653	0,000	0,111	0,262
Benshagul Gumuz	-0,16	0,319	0,547	0,000	0,1004	0,451
SNNP	0,214	0,026	0,602	0,000	-0,069	0,328
Gambelia	0,015	0,932	0,552	0,000	0,125	0,362
Harari	-0,796	0,000	0,226	0,053	0,444	0,000
Addis Ababa	-0,618	0,000	0,375	0,000	0,187	0,06
Dire Dawa	-0,262	0,046	0,353	0,001	0,168	0,109
Demand identification						
Death or illness	0,061	0,575				
Loss of income	0,501	0,279				
Affected by climatic events	0,332	0,000				
Price change on food	0,172	0,053				
Shock/accicdent	0,174	0,001				
Other	0,148	0,331				
constant	1,415	0,000	0,68	0	-0,944	0,000

Significant at * 1%, ** 5%, *** 10%

Wald chi2(21)=87 with prob > chi2=0.000, rho= -0.994, atrho=--0.770, LR test chi2(1)= 19 with prob > chi2=0.000

4.6 General
4.6.1 Demand:

For the overall regression on household demanding credit, following characteristics gave significant result:

The formal and informal markets combined appear to prefer male borrower to female borrower. Male household heads are more likely to demand credit than their female counterparts are. The probability of demanding credit is 12 present higher in favor of the male-headed households. In general, the result indicates also that female household heads are more likely to be credit constrained than their male compatriots are. The female-headed households are 19.7 % more credit constrained than the male-headed ones.

Household without educated "head" demands more than those with educational background in the overall credit market (combined informal and formal markets). Household heads without education are 16.9 % likely to demand credit.

Household that own house have 17.5 percentage higher probability of demanding loan than those renting a house. These could be explained as collateral or asset for the lenders. Moreover, household that do not own (non-agricultural) enterprise or business are also likely to be credit constrained in the overall market. Household that do not intend to open business are also 15 % more likely to be credit constrained.

The age of the household head plays a vital role in determining the credit worthiness of a household. Household with non-middle aged head have higher probability of being credit constrained.

When Tigray is kept as the base, the demand for credit has more varieties across the regional states. Afar, SNNP, Harari, Addis Ababa and Dire Dawa have significantly higher probability of demanding credit than other regions in general, whereas SNNP region appears to demand more than other regions. It is also, where most of borrowers originate from according to the ESS.

Holding Tigray omitted, the total result presents that the rest of regions to be credit constrained. These can partially be explained by the existence of high supplier of formal institution in Tigray relative to the rest of the regions. Similar results were also found in Ibrahim's studies.

In general adverse events that occur as result of climate change, price change on commodity and shocks or accidents on one of household members increases demand for credit. The increased demand in the aforementioned grouped could be understood as strategy to cope with the mentioned adverse event.

4.6.2 Received general character

Characteristics that seems to increase the likelihood of receiving credit in the overall markets are age, gender, owning non-farm enterprise, owning a house and plan to open business.

Male "head" is 20 % more likely to receive credit than their female counterpart is. Household that either own their own house and non-agricultural enterprise have 18.6 % and 16.9 % respectively higher probability to get credit. Middle-aged household heads have higher propensity of receiving credit.

The descriptive result on region shows large distribution of credit occurring in Tigray, similar to the result achieved by the regression. Tigray region being omitted the result shows less probability of getting loan in other regions. Like mentioned earlier also, Ibrahim found similar when it comes to analysis of region and specially Tigray.

Totally discouraged household covers higher portion of the resident in general. Household from Tigray, Amhara and Addis Ababa appears to be less discouraged by 51, 57 & 60 percent respectively. However, household in region such as Somalia, SNNP & Gambelia have highest probability of being discouraged with 74, 71 & 70 percentage. One of the explanation have been the accessibility of creditors(Love and Sánchez, 2009). The distribution of credit in formal and informal institution states also great dispersion in granting a loan. The region variables indicate that most of formal transaction to occur in Tigray region. These is further support by finding of Degefe, where he stated that 72 % of formal service occurring in Tigray. Afar have also indicate to have a low rate of coverage from formal institution.

4.6.3 The results of regression analysis for the overall financial sector

Table 4.7: Regression result in the overall credit markets

| | ML-estimation | | | | | |
| | Demand | | General Credit constrained | | Received | |
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Household characteristics						
Numbers of childeren	0,009	0,87	0,003	0,941	-0,002	0,954
Numbers of adults	-0,013	0,834	0,025	0,554	-0,025	0,545
(Household size)	-0,0001	0,989	-0,029	0,453	0,031	0,446
Personal characteristics						
Age	0,012	0,189	-0,012	0,11	0,013	0,099
Age square/100	-0,014	0,123	0,012	0,106	-0,013	0,099
Gender (male)	-0,143	0,012	-0,197	0,000	0,2001	0
Own non-agric entrepr.	-0,112	0,128	-0,169	0,004	0,169	0,004
Education	-0,166	0,002	-0,021	0,612	0,025	0,56
Plan to open business	-0,053	0,351	-0,236	0,000	0,236	0
Owning a house/dwelling	-0,166	0,100	-0,186	0,015	0,186	0,015
Regional characteristics						
Afar	-0,566	0,000	0,651	0,000	-0,653	0,000
Amhara	-0,024	0,789	0,158	0,018	-0,156	0,020
Oromia	0,092	0,323	0,468	0,000	-0,47	0,000
Somalie	-0,085	0,548	0,701	0,000	-0,704	0,000
Benshagul Gumuz	-0,15	0,355	0,585	0,000	-0,587	0,000
SNNP	0,264	0,006	0,591	0,000	-0,593	0,000
Gambelia	0,051	0,778	0,558	0,000	-0,559	0,000
Harari	-0,768	0,000	0,463	0,005	-0,467	0,004
Addis Ababa	-0,632	0,000	0,615	0,000	-0,617	0,000
Dire Dawa	-0,243	0,074	0,419	0,000	-0,421	0,000
Demand identification						
Death or illness	0,078	0,509				
Loss of income	0,601	0,185				
Affected by climatic events	0,346	0,000				
Price change on food	0,221	0,021				
Shock/accicdent	0,204	0,004				
Other	0,171	0,301				
constant	1,386	0,000	0,729	0	-0,745	0,000

Significant at * 1%, ** 5%, *** 10%

Wald chi2(1)= 191.04 with prob > chi(21)= 0.000 ,athrho= -0.987, rho= -0.756, LR test: chi2(1)= 11.40,, prob > chi2 =0.0007

5 Chapter

5.1 Discussion

The determinants of credit constraints in Ethiopia were analyzed and investigated by the use of regression and descriptive calculation on the ESS survey. This study has found several factors affecting the various households' access to credit in both the formal and informal sector. Gender, age, education level, properties of the head of household and the regional state the household reside in are among the variables that affect the chance of a household getting a loan plication approved. Female, young, small sized family of 1-3, not owning enterprise (business), not owning house, not having plan to open business and residence in Gambella, Afar and Somalie are typically related to being credit constrained. On the other hand, household with features such as male, owning enterprise, family size of 3-9, plan to open business, not educated and are residence in Tigray, Amhara or Oromia have higher probability of receiving credit.

Among others reason discouragement from applying for credit have held large portion of the population out of the credit market. Initiated by the process explained in achieving credit can credit constrained occur as self-selection out of credit market (Love and Sánchez, 2009). Moreover, the access to credit was divided using the source of credit formal and informal institution. Surprisingly regional areas played a role in affecting the probability of getting credit, based on accessibility and service provide for their residence. Meaning in some regions the existence of formal market are broader than other areas. Non-existence of formal credit market affects the approach the borrowers have towards the market. Limited access to the formal credit market might leave unmet demand for credit in several household. Such incidence has been reported to emerge as result of lack in agreement matching households need (Love and Sánchez, 2009). Different variables appear to be determinants credit constrained household in formal and informal sectors. Credit constrained household account for large portion of the population. The share of household taking informal loans are higher than the portion borrowing from formal. Duo to features as fragile demand for credit, the participation rate in credit market are portrayed to be low. The interaction between lenders and borrowers have be reported to have positive indication for receiving loan by Love & Sánchez (Love and Sánchez, 2009). Access of financial suppliers in the region might affect the transaction of formal credit among other by reduction of transaction cost. The affect might appears as physical approach and interaction of formal creditors (Fichera, 2010).

The result further indicate household that have higher probability of demanding credit, also have higher likelihood of being credit constrained. Love & Sanchez (Love and Sánchez, 2009) also found similar result. This result appears as conflict on counter to what intuition would lead one to expect(Love and Sánchez, 2009). Love and Sanchez (2009) states first explanation to be that the amount receive and predicted proportion of credit attainment in both market being very low as the cause. Secondly, variables included in the model can differ from what the lenders use to base their decision on, some unobservable factors not captured by these variables(Love and Sánchez, 2009).

Household with asset such as owning house and enterprise are found to be less credit constrained, which also consists with the literature. Household that owns a house seems to demand loan from formal market, and have higher probabilities to get their demands met from the formal market as presented in the result chapter. Net wealth is stated as a tool for measurement of current and future proxy (Ibrahim et al., 2007, Crook, 2006) . This clarification can affect the determinants of credit constraints. Owning asset might be explained as risk adjustment system implied by the formal institutions(Love and Sánchez, 2009).

Age is one of the variables where the effect can have different outcome and implications. In formal market, younger participator had higher probability of being constrained. In other words, participators over 30 years and under 60 were more favored. However, Tang (Tang et al., 2010) reported that older head to benefit more based on their established social network and capital. Younger participator can be categories as more risky customers; while the "older" can be perceived to have established credit history and collateral. Degefe reports MFIs in Ethiopia to mainly serve households that are between age of 18 and 59, leaving participators above age of 60 out of the credit market (Obo, 2009).

The informal market had no emphasis on age. Nevertheless, Kochar (Yusuf Ibrahim Kofarmata, 6.10.2016)) explains that the probability of older had to demand loan in informal market increase as a result of lacking members undertake income. Nwara, found similar correlations between age and credit in Nigeria (Nwaru et al., 2011). Mpuga explains from his research in Uganda that the middle-aged head of household to receiving more as the need for credit increase with age until certain age. By fear of leaving debt for their children, head of household decreases their demand for credit as older they get (Mpuga, 2010).

The level of education obtained by the head of the household can be seen as positive advantage for receiving credit in informal credit. For the formal sector, education did not play any role according to the regression analysis. Variables that are found in the literatures have indicated to serve participators without educational background, giving educated head barriers(Yusuf Ibrahim Kofarmata, 6.10.2016). Literatures have found education to have both important and irrelevant effect on credit. Tang (et al 2010) have stated that educated household heads might approach informal market, based on knowledge on regulation of credit system for their own benefit. Further, the understanding of credit market system and diversification of their demand in different market (Yusuf Ibrahim Kofarmata, 6.10.2016). However, opposing literature such as Tin (Yusuf Ibrahim Kofarmata, 6.10.2016) have raised the matter of education to be negative.

Gender was substantial for both market where female were constrained. Microfinance institutions such as women association arise to contribute and reinforce women in diverse developing economy according to Degefe (Obo, 2009). However, the result shows that more male household heads approach formal lenders more frequently than their female counterparts. Both in formal and informal market are the result of gender giving the same outcome. Meaning, household with female head are more often credit constrained in both market. The reduced number of female participator in the credit market can partially be the explanation for such outcome. Diverse social norms in developing countries can work as barrier for women for participation in economic activity, social roles, norms, household chores, social construction. As a combine result of such incidence female are more likely to be credit constrained (Steiner et al., 2009, Nwaru et al., 2011). Eyerusalem (Eyerusalem, 2014) reports several social obligation for women as barrier to enter credit market in Ethiopia. Such outcome appears in higher rate in rural areas than urban (Eyerusalem, 2014). The result of this study indicates the same, low participation of women in the credit market.

The credit market outreach of formal and informal institutions to serve the diverse demand differs throughout the various regional states in Ethiopia. The occurrence of credit constrained households in Ethiopia is widespread across the whole country. Household resident in SNNP, Amhara, Tigray and Oromia are more likely to demand. To investigate if the demand for credit is tied to specific supplier, observations of demand in formal and informal sectors are conducted. From the result, outline of household demanding credit through formal and informal institution differs. Both Ibrahim (Ibrahim et al., 2007) and Degfe (Obo, 2009) found common trends for regional variables in Ethiopia, similar to this study. Table 5.5 describes the outline of

credit distribution throughout the country. Degefe, reports formal institution for being scarce in Ethiopia (Obo, 2009) through his studies Tigray, Amhara and Oromia are the only regions to receive more from formal than informal suppliers. Regions such as Afar, Gambella, Harari, Somalie and Bensihagul-Gumuz were stated to lack established and developed formal association (Obo, 2009). As the result of this study, the insignificant estimates on regional variable can be somewhat explained. Moreover, Degefe states the presence of stabilized and established NGOs, microfinance institutions and development association in the rest the regions (Obo, 2009).

Degefe, found in his research that 72 % of formal lenders to service the resident of Tigray (Obo, 2009).Table 5.1 exhibits the finding of Degefe where Tigray region is to be dominant of formal lenders. The highly positive incidence of formal institution in Tigray requires further investigation. Findings from such research brought the Relife Society of Tigray (REST). These development association is stated to have been existing since 1978 (Obo, 2009, Haregeweyn et al., 2006). REST`s outreach and effectivity have been claimed to be among the most productive in Africa (Haregeweyn et al., 2006, Obo, 2009).

Adverse event have given significant effect on demand for credit and transpires as uncertainty occasion. In such event, default might arise based on the risk and unexpected event that require funds(Tang et al., 2010). The risk involved might be based on the repayment ability, which can effect lenders decision. Lenders fear can arise as risk on default (Meyer, 2002).

Amount, default rate and repayment time:

Duration of the loan, size and default rate should be studied closer. Our data indicate great transaction of small amount of loans from the formal sector. However, few (3) high amount of credit have been given by commercial bank of Ethiopia (specific for 2 regions, Amhara & Oromo). The efficiency of the formal creditors might also affect the accessibility and the service for the residence (ANJULO and HAWASSA, 2014). The descriptive result achieved between large size and receiving of credit, have been explained by Oluwasola and Alimi in their study in Nigeria as, (Oluwasola and Alimi, 2008), due to ownership of large assets such as farm. Meaning, large family might also be owner of larger assets such as farm or other collateral.

Ibrahim verifies the findings that most of household are credit constrained based on discouragement for application on credit (Ibrahim et al., 2007). In addition, informal institution

covers most of the credit resource, except for Tigray region. Household asset is another variable that are found to affect the access for credit both in this and in Ibrahim's studies.

In this study, the ineligible for credit have been defined as female, under the age of 29, above the age of 60, family member between 1-3 and household without asset such as house. While poor household, uneducated and household with children were classified as excluded according to Ibrahim. In addition, he stated nonappearance of gender discrimination, which conflicts with the results of this study.

5.2   Policy

Consequence of shortage on credit like it have also been mentioned to lead to less efficient development. As it is also explained credit can be view as element for alleviation from poverty (Braverman and Guasch, 1986, Obo, 2009). From the result it is explained that shortcoming of credit supplier can also effect the possibility of being credit constrained. By exploiting existing strong social ties policy targets may focus on financial linkage between formal and informal sectors to enhance access to credit in the future (Braverman and Guasch, 1986). Another initial step can be women involvement in credit and empowering them with the right kind of tools.

Lova and Sanchez, states that removing credit constrained to increase the probability of investment (but it is based on enterprise). They further suggest to increase level of practical loaning for a certain share of risk adjusted interest rate (Love and Sánchez, 2009).

Table 5-1 Developed institution in Ethiopia

Regions	Institution
Tigray	Relief Society of Tigray (REST), Tigrayan Development Association (TDA)
Amhara	Amhara Development Association (ADA)
SNNP	Southerner Ethiopian People`s Development Association (SEPDA)
Oromo	Oromo Development Association (ODA)
Addis Abeba and Dire Dawa	National NGO`s

Source: Degefe, micro finance in Ethiopia 2009

5.3 Limitation of data

The limitation on this study occurs as result of lack on vital information on important variables from the ESS dataset and the countries imperfect credit market. Information on lenders strategy and targets are not reported in the ESS, due to their focus on agricultural factors. These leads to lack of variables such as default rate, cost of the loan, average repayment etc.

5.4 Conclusion

- MFIs are the largest credit provider in formal sector, while relatives and neighbors account for more than 60 percent of the total loans in the informal sector. These indicate that household approach people they know for loans in informal sector.
- Gender plays a great role in determining who gains access to credit. Male-headed households are more often demanding and receiving credit both from formal and informal credit markets, while the opposite was true for the female-headed households.
- Participators in credit market that are under the age of 29 and above the ages of 60 are demanding and receiving less credit, while those between 30 &59 are both demanding and receiving more in both markets. This effect is even more pronounced in the informal markets.
- Household heads without education have higher demand and get more credit in the formal markets, while their educated counterparts have the edge in the informal markets.
- The households that could provide assets such as houses and business enterprises as collateral have an advantage in both formal and informal markets.
- The household size is also important variable in determining the applicant's success in the credit markets. Larger households are more likely to demand and receive credit in both markets.
- The residence of Tigray and Amhara regional states have higher demand for credit than the other regional states. They along with the Oromia regional state have more of their demand credit covered from the formal sector than the remaining part of the country. Whereas the Harari, Somalie regional states have an absent formal credit market, and they have access to credit solely through the informal markets.

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Appendices

Appendix A: Result form Heckman two-step estimation
Code for Heckmans two-step estimation:

xi: heckman cc i.region i.gender i.ownnonagricltureent size children adults age agesqu100 edu i.dwellingocc i.plantoopenbusiness, twostep select(demand = i.region i.gender i.ownnonagricltureent size children adults age agesqu100 edu i.dwellingocc i.plantoopenbusiness i.deathillness i.lostofincome i.climate i.shocksaccicdent i.pricechange i.other) rhosigma

Bivariate Probit regression with sample selection model can be conducted by two estimation procedures, two-step and maximum likelihood. The result and further explanation about two-step procedure is shown in the appendix. Green (1992) indicate the standard errors on maximum likelihood procedure to be smaller than those yielded by the two-step estimation method do (Greene and Hensher, 2010).

The regression analysis can also be conducted by the use of two-step estimation(ref. Nawata 1994). The result achieved by the use of two-step estimation is shown in appendix B.1 It resembles with result attained though maximum-likelihood. The model is the same, just the procedure of the estimation that differs between maximum likelihood and two-step estimation (Nawata, 1994). Least square method is applied when we estimate by the use of Heckman`s two-step (Nawata 1994). For two-step estimation, first probit regression occurs. For the second equation Inverse Mills ratio is included in the regression to account for the data being non-random (Hill et el 2010).

Appendix A.1: Regression result for formal sector

	Two-step estimation					
			Formal			
	Demand		Credit constrained		Received	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Household characteristics						
Numbers of childeren	0,023	0,701	0,007	0,849	-0,01	0,319
Numbers of adults	-0,0004	0,999	0,023	0,577	-0,013	0,223
(Household size)	-0,012	0,826	-0,029	0,457	0,017	0,093
Personal characteristics						
Age	0,013	0,136	-0,009	0,196	0,004	0,034
Age square/100	-0,015	0,09	0,009	0,194	-0,004	0,046
Gender (male)	-0,122	0,031	-0,196	0,000	0,052	0,000
Own non-agric entrepr.	-0,109	0,142	-0,169	0,003	0,016	0,296
Education	-0,169	0,002	-0,038	0,328	-0,005	0,68
Plan to open business	-0,057	0,317	-0,216	0,000	0,027	0,014
Owning a house/dwelling	-0,174	0,083	-0,187	0,010	0,057	0,002
Regional characteristics						
Afar	-0,598	0,000	0,485	0,000	-0,262	0,000
Amhara	-0,049	0,589	0,148	0,024	-0,112	0,000
Oromia	0,064	0,491	0,456	0,000	-0,176	0,000
Somalie	-0,155	0,276	0,662	0,000	-0,308	0,000
Benshagul Gumuz	-0,173	0,286	0,537	0,000	-0,24	0,000
SNNP	0,246	0,011	0,583	0,000	-0,231	0,000
Gambelia	0,007	0,966	0,541	0,000	-0,266	0,000
Harari	-0,795	0,000	0,234	0,041	-0,251	0,000
Addis Ababa	-0,661	0,000	0,383	0,000	-0,188	0,000
Dire Dawa	-0,285	0,037	0,381	0,001	-0,211	0,000
Demand identification						
Death or illness	0,1006	0,418				
Loss of income	0,533	0,248				
Affected by climatic events	0,257	0,002				
Price change on food	0,266	0,007				
Shock/accicdent	0,233	0,002				
Other	0,073	0,679				
constant	1,371	0,000	0,652	0,000	0,119	0,012

Significant at * 1%, ** 5%, *** 10%

Rho= -0.496, sigma = 0.314, Mills lamda = -0.156, Wald chi2(21)= 414 with prob > chi2 =0.000

Appendix A.2: Regression result for informal sector

	Two-step estimation					
			Informal			
	Demand		Credit constrained		Received	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Household characteristics						
Numbers of childeren	0,023	0,701	0,0103	0,801	0,006	0,709
Numbers of adults	-0,0004	0,999	0,024	0,56	0,002	0,902
(Household size)	-0,012	0,826	-0,031	0,427	-0,0039	0,81
Personal characteristics						
Age	0,013	0,136	-0,009	0,186	-0,002	0,933
Age square/100	-0,015	0,09	0,009	0,182	0,0001	0,954
Gender (male)	-0,122	0,031	-0,198	0,000	0,03	0,083
Own non-agric entrepr.	-0,109	0,142	-0,175	0,002	0,057	0,019
Education	-0,169	0,002	-0,045	0,254	0,027	0,128
Plan to open business	-0,057	0,317	-0,226	0,000	0,064	0,000
Owning a house/dwelling	-0,174	0,083	-0,189	0,009	0,019	0,503
Regional characteristics						
Afar	-0,598	0,000	0,506	0,000	0,071	0,230
Amhara	-0,049	0,589	0,148	0,024	0,051	0,060
Oromia	0,064	0,491	0,456	0,000	-0,017	0,532
Somalie	-0,155	0,276	0,653	0,000	0,037	0,327
Benshagul Gumuz	-0,173	0,286	0,547	0,000	0,029	0,578
SNNP	0,246	0,011	0,602	0,000	-0,021	0,468
Gambelia	0,007	0,966	0,552	0,000	0,045	0,397
Harari	-0,795	0,000	0,226	0,053	0,145	0,027
Addis Ababa	-0,661	0,000	0,375	0,000	0,035	0,503
Dire Dawa	-0,285	0,037	0,353	0,001	0,055	0,185
Demand identification						
Death or illness	0,1006	0,418				
Loss of income	0,533	0,248				
Affected by climatic events	0,257	0,002				
Price change on food	0,266	0,007				
Shock/accicdent	0,233	0,002				
Other	0,073	0,679				
constant	1,371	0,000	0,68	0	0,178	0,018

Significant at * 1%, ** 5%, *** 10%

Rho= -1, sigma= 0.516, Mills lamda= -0.516, Wald chi2(21)= 40.83 with prob > chi2 = 0.0059

Appendix A.3: Regression result for general

Two-step estimation

	General Demand		Credit constrained		Received	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Household characteristics						
Numbers of childeren	0,023	0,701	0,004	0,854	-0,004	0,862
Numbers of adults	-0,0004	0,999	0,01	0,646	-0,103	0,64
(Household size)	-0,128	0,826	-0,013	0,539	0,013	0,534
Personal characteristics						
Age	0,014	0,136	-0,003	0,383	0,003	0,368
Age square/100	-0,016	0,09	0,003	0,397	-0,003	0,388
Gender (male)	-0,122	0,031	-0,082	0,000	0,083	0
Own non-agric entrepr.	-0,109	0,142	-0,074	0,017	0,075	0,018
Education	-0,169	0,002	-0,022	0,341	0,023	0,312
Plan to open business	-0,057	0,317	-0,092	0,000	0,092	0
Owning a house/dwelling	-0,175	0,083	-0,075	0,047	0,076	0,047
Regional characteristics						
Afar	-0,598	0,000	0,192	0,012	-0,192	0,012
Amhara	-0,049	0,589	0,063	0,073	-0,062	0,079
Oromia	0,064	0,491	0,193	0,000	-0,194	0,000
Somalie	-0,155	0,276	0,269	0,000	-0,27	0,000
Benshagul Gumuz	-0,173	0,286	0,211	0,002	-0,211	0,002
SNNP	0,246	0,011	0,25	0,000	-0,251	0,000
Gambelia	0,007	0,966	0,221	0,001	0,221	0,002
Harari	-0,795	0,000	0,097	0,251	-0,097	0,253
Addis Ababa	-0,661	0,000	0,154	0,023	-0,154	0,024
Dire Dawa	-0,285	0,037	0,155	0,005	-0,155	0,005
Demand identification						
Death or illness	0,1001	0,418				
Loss of income	0,534	0,248				
Affected by climatic events	0,256	0,002				
Price change on food	0,267	0,007				
Shock/accicdent	0,234	0,002				
Other	0,074	0,679				
constant	1,371	0	0,696	0	0,299	0,002

Significant at * 1%, ** 5%, *** 10%

Rho: 1 , sigma = 0.668, Mills lamda = 0.668, Wald chi2(21)=126 with prob > chi2 =0.0000

Appendix B:

Stata Codes for this study (general, formal and informal)

<u>Bivariate Probit regression with sample selection (ml), code</u>

xi: heckprob cc i.region i.gender i.ownnonagricltureent size children adults age agesqu100 edu i.dwellingocc i.plantoopenbusiness, select(demand = i.region i.gender i.ownnonagricltureent size children adults age agesqu100 edu i.dwellingocc i.plantoopenbusiness i.deathillness i.lostofincome i.climate i.shocksaccicdent i.pricechange i.other)

<u>Heckman sample selection (two-step), code</u>

xi: heckman cc i.region i.gender i.ownnonagricltureent size children adults age agesqu100 edu i.dwellingocc i.plantoopenbusiness, twostep select(demand = i.region i.gender i.ownnonagricltureent size children adults age agesqu100 edu i.dwellingocc i.plantoopenbusiness i.deathillness i.lostofincome i.climate i.shocksaccicdent i.pricechange i.other) rhosigma

The data set and the original ESS survey is also attached

Appendix C:

Table: C.1 Sample design by region and zone in rural and urban area from ESS

Region Code	Region Name	Zone Code	Zone Name	Rural		Small towns (urban)		Mid- and large-sized towns (urban)	
				EA	HH	EA	HH	EA	HH
1	Tigray	1	North Western	5	58	1	12	1	15
		2	Central	7	79	1	8	2	30
		3	East	6	71	1	11	2	30
		4	South	6	68	1	12	1	15
		5	West	6	69	0	0	1	15
		6	Mekelle Town	0	0	0	0	8	120
2	Afar	1	Zone-1	7	70	1	12	1	13
		3	Zone-3	3	33	1	8	0	0
3	Amhara	1	North Gonder	7	77	2	23	4	60
		2	South Gonder	6	67	1	10	1	15
		3	North Wollo	8	94	1	12	1	15
		4	South Wollo	6	67	1	9	2	30
		5	North Shewa	7	79	1	11	1	15
		6	East Gojam	6	70	1	10	1	15
		7	West Gojam	7	80	1	12	1	15
		8	Wag Himra	3	31	1	10	0	0
		9	Awi	5	58	1	9	1	15
		10	Ormiya	3	34	1	11	0	0
		11	Bahirdar	0	0	0	0	3	45
		12	Argoba Special Wereda	3	35	0	0	0	0
4	Oromiya	1	West Wellega	4	48	1	12	1	15
		2	East Wellega	3	34	1	12	0	0
		3	Ilu Aba Bora	3	35	1	11	1	15
		4	Jimma	4	47	1	9	0	0
		5	West Shewa	3	35	1	10	1	15
		6	North Shewa	3	35	1	8	0	0
		7	East Shewa	4	44	0	0	2	29
		8	Arsi	3	34	1	11	1	15
		9	West Hararge	4	48	1	11	1	15
		10	East Hararge	3	36	1	12	0	0
		11	Bale	4	45	1	12	1	15
		12	Borena	3	36	0	0	0	0
		13	South West Shewa	3	35	1	8	1	15
		14	Guji	3	34	0	0	0	0
		15	Adama town	0	0	0	0	6	90
		16	Jimma	0	0	0	0	2	30
		17	West Arsi	3	36	0	0	3	45
		18	Qelleme Wollega	2	24	0	0	0	0

Source: From ESS

Table: C.2 Files for household

Section	Section Name/ Content	Dataset Filename	Unique identification variables
Cover	Cover	sect_cover_hh_w2	household_id2
1	Roster	sect1_hh_w2	individual_id2
2	Education	sect2_hh_w2	individual_id2
3	Health	sect3_hh_w2	individual_id2
4	Labor and Time Use	sect4_hh_w2	individual_id2
5A	Food Consumption Last 7 days	sect5a_hh_w2	household_id2 hh_s5aq00
5B	Food Consumption Last 7 days	sect5b_hh_w2	household_id2 hh_s5bq00
5C1	Meal Sharing Last 7 days	sect5c1_hh_w2	household_id2
5C2	Number of Days Meal shared Last 7 days	sect5c2_hh_w2	household_id2 hh_s5cq00
5D	Food away from home in Last 7 days	sect5d_hh_w2	household_id2 hh_s5cq0b
6A	Non-Food Expenditure (one month)	sect6a_hh_w2	household_id2 hh_s6aq00
6B	Non-Food Expenditure (one year)	sect6b_hh_w2	household_id2 hh_s6bq00
7	Food Security	sect7_hh_w2	household_id2
8	Shocks	sect8_hh_w2	household_id2 hh_s8q00
9	Housing	sect9_hh_w2	household_id2
10	Household assets	sect10_hh_w2	household_id2 hh_s10q00
11A	Non-Farm Enterprises Filter	sect11a_hh_w2	household_id2
11B	Non-Farm Enterprises (at the household-enterprise level)	sect11b_hh_w2	household_id2 hh_s11bq00
11C	Non-Farm Enterprises (questions 18-19 at the household level)	sect11c_hh_w2	household_id2
12	Other Income	sect12_hh_w2	household_id2 hh_s12q00
13	Assistance	sect13_hh_w2	household_id2 hh_s13q00
14A	Credit (Household Level)	sect14a_hh_w2	household_id2
14 B	Credit (Loan Level Information)	sect14b_hh_w2	household_id2 hh_s14q00
14C	Credit (Household Level)	sect14c_hh_w2	household_id2

Source: From ESS

Table C.3 Description of variabels used

Variable	Observation	Mean	Std. Dev.
Region	5165	5.6374	3.8999
No Demand	5165	0.0997	0.2996
Receive	5165	0.2581	0.4376
Demand	5165	0.9003	0.2996
Credit constriant	5165	0.6424	0.4793
Size	5165	4.9076	2.5517
Children	5165	2.0404	1.7973
Adults	5165	2.8666	1.5556
Age	5165	44.1696	15.5957
Age squared/100	5165	21.8956	15.4528
Education	5165	0.4822	0.4997
Formal	5156	0.1032	0.3042
Informal	5165	0.145	0.3614
Gender ~Male	5165	0.6964	0.4598
Own enterprise	5165	0.1129	0.3164
Ownin house	5165	0.7212	0.4484
Renting house	5165	0.2037	0.4028
Plan to open business	5165	0.2437	0.4294
Death/ illness	5165	0.0501	0.2182
Loss of income	5165	0.0060	0.0772
Climate effect	5165	0.1392	0.3461
Shock/accident	5165	0.1864	0.3895
Price change	5165	0.1022	0.3029
Other	5165	0.0243	0.1542

Source: From ESS