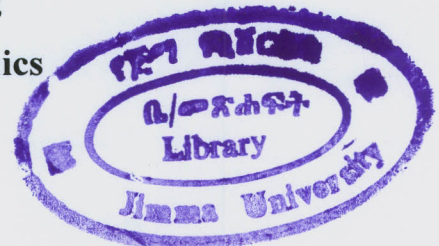


**Determinants of the Geographical Distribution of Bank Branches: A Case in
Ethiopian Commercial Banking Industry**

Research Paper Submitted To the Research, Graduate Studies & CBE Office

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Abstract

Today banks are performing all kinds of banking transactions and providing various financial services in order to make life easier for people in a given country. Banks should consider the demographic, economic and social characteristics of the geographical regions in branch site selection in order to provide the best financial services in line with their customers' demand. And the main purpose of this study was to gather and analyze the factors that determine the Geographical Distribution of Bank Branches: A Case in Ethiopian Commercial Banking Industry with respect to regions and cities. Both state owned commercial banks and private owned commercial banks were taken for the study. The study used both primary and secondary sources of data which covered from the year 2006-2011. The primary data was collected through unstructured interview and the secondary data was collected through document analysis and analyzed using descriptive and inferential statistics. To examine the influence of economic, social-cultural and demographic variable on decision of bank branch location selection over time, panel regression models were used using Normality of the error term, Heteroscedasticity, Multicollinearity and Model specification test. Accordingly, government capital expenditure, number of employed population, number of firms in all sectors and the Number of Vocational Training School and Undergraduate Students are vital determinants of the geographical distribution of bank branches in Ethiopian commercial banking sector.

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Chapter One: INTRODUCTION

1.1 .Background Of the Study

Today banks are performing all kinds of banking transactions and providing various financial services in order to make life easier for people. Customers are demanding speed and convenience in banking transactions, high efficiency and confidence in their investments and financing services with convenient limits and reasonable cost (Dilara Keskin and Zehra Abdioglu, 2011). And also banking sector which makes up an important component of the finance system is to act as an intermediate between individuals and institutions with an excess of funds and those with a need for funds (Sayilgan, 2003).

Basically banks provide service in two ways; under unit banking system and branch banking system. Unit banking refers to a single bank which renders services and operates without any branches anywhere. Unit banking operate one full banking service. This kind of banking system is common in the USA (Berger, 1998). There is one bank in our country that is Zemen bank.

But branch banking is the act of doing one's banking business at a location that is separate from the bank's central business location. Many large and small banks use branch banking in order to extend the reach of their services to different locations in a community. Smaller branches are also less expensive to operate, and often easier for customers to access, while providing all of the features of a larger bank (<http://www.wisegeek.com>).

Historically, branch banks were part of a larger building, often found in strip malls or even in grocery stores or discount stores, sharing the location with another business. Today, however, branch banking can take place at a number of different locations, and many banks build individual branch locations that are independent of other businesses. Each type of location is still considered a branch bank.

Banks should consider the demographic, economic and social characteristics of the geographical regions in branch site selection in order to provide the best financial services in line with their customers' demands. Banks usually prefer regions and cities with comparative advantage in terms of demographic, economic and socio-cultural characteristics when they are making decisions about opening or closing a branch at a region and city. However, they are faced with the question of which factors are more effective on selection of branch site with regards to

regions and cities. The determination of variables influencing branch site selection for regions and cities would provide bank managers with effective insights into the selection of the most appropriate sites for opening bank branches.

In this respect, gathering and analyzing the factors determining the distribution of bank branches in Ethiopia with respect to regions and cities is the main purpose of this present study. For the purpose of the study, variables which stand out regarding the distribution of bank branches according to regions were tried to be determined by examining the impact of demographic, economic and socio-cultural variables on the selection of bank branches for nine regions and two town administrations in Ethiopia for the 2006-2011 period.

1.2. Banking Sector in Ethiopia

The use of modern money in Ethiopia dated back to before 2000 years (Pankrust in Belay, 1990). It was started during the Axumite era which can stretch from 1000 BC to around 975 AD. Taking this point as reserved, banking industry in Ethiopian context started in 1905 with the Establishment of the first Ethiopian bank in history called Abyssinian Bank based on a 50 years agreement with the Anglo-Egyptian National Bank. In 1908 a new development bank (named Society National Ethiopia pour le Development de l' Agriculture etdu commerce) and two other foreign banks were established (Pankrust, 1968). These banks had their own limitations in that they were foreign owned. The Abyssinian Bank was purchased by the Ethiopian Government in 1931 and during that time it was a dominant bank and it is renamed as 'Bank of Ethiopia'.

There was an expansion in banking activities in those five years of Italian occupation. In those times the Italian Banks were dominant in their activity. After independence the role of British Bank Paramount owing to its strategic consideration in world war II, Barclay bank had established and was in Ethiopia from 1941 to 1943 (Belay, 1990). After great commitment that, state bank of Ethiopia was established in 1943. It was a painful process for Britain (Befekadu, 1995). This Bank was operating both as commercial and central bank until 1963 when it was dissolved into today's National bank of Ethiopia and the commercial bank of Ethiopia.

All privately owned financial institutions including three commercial banks, thirteen insurance companies and two non bank intermediaries were nationalized on 1, January 1975. The Nationalized banks were recognized and one commercial bank (the commercial bank of Ethiopia), a national bank (recreated in 1976), two specialized banks Agricultural Bank of Ethiopia and Industrial Bank of Ethiopia; and a housing and saving Bank-renamed recently as the construction and business Bank) as well as one insurance company, Ethiopian Insurance company were formed. Following the regime change in 1991 and the liberalization policy in 1992, these financial institutions were recognized to work along the publicly owned ones (Alemayehu, 2006).

1.3. Statement of the problem

Over the last few years, significant changes have been taking place in the banking environment. Deregulation and growing global competitive pressures in the banking services, have led to a wave of mergers, which result in larger, more complex, and more difficult to manage networks. At the same time the new way of doing business by taking advantage of information networks and transferring the greater volume of banking transactions to centralized back offices, allows for smaller and more flexible bank branches, which operate at a lower cost. In recent years, these factors have made the design of a bank branch network a more complex issue, but also a topic of increasing interest.

The rapid increase in new private banks after the 1991 financial liberalization interrupted more than thirty years of severe barriers to entry in banking markets. Bank Branches increased from 215 in 1994 to 562 in 2008 (Getahun Nana 2008). But the numbers of branches are very small when we relate the total population and compare with other countries. According to Getahun Nana (2008), the ratio of branch to population is 135,404 people per one bank branch and there was one branch per 1964 square kilometers. Compare these figures with 96 branches per 1000 people and 790 bank branches per 10,000 square kilometers in Spain (World Bank, 2008). Thus, mainstream bank branches are hardly accessible to rural poor.

Moreover, the Ethiopian banking system has been characterized by a higher degree of regional overlap (over concentration in one or two cities or regions). From the total bank branches more than 37.9% found in Addis Ababa and around Addis Ababa (Getahun Nana 2008).

But expansions of more bank branches are very important in least developing countries like Ethiopia to provide face to face banking service because in these countries there are no accesses of modern banking technology to use unit banking and the people are less literate.

Despite this emphasis, factors which constraint the geographical expansion of bank branches have been addressed by few studies such as H. Dilara Keskin and Zehra Abdioglu, (2011), Giorgio C and Riccardo De (1999). They focused on economic, social, cultural and demographic factors in developed countries context, making it unclear whether these factors similarly affect the decision of geographical consecration of bank branches in developing countries particularly Ethiopia which not has enough bank branches and has un proportional geographical distribution

of bank branches. Thus, this paper will focus on the determinants of geographical distribution of bank branches: a case in Ethiopia commercial banking industry.

In short, in this study the researchers will aim providing evidence to the following basic

Research questions:

1. What are the important bank branch expansion practices in Ethiopia commercial banking industry?
2. How economic, socio-cultural, demographic and technological factors affect the decision of geographical distribution of bank branches?

1.4. Objective of the study

General objective

The main objective of this study is to examine factor which affect the geographical distribution of bank branches in Ethiopian commercial banking industry for the year 2005 to 2010.

Specific objectives

The specific objectives of this study are;

1. To identify the bank branch expansion practices on Ethiopian commercial banking industry.
2. To examine the effect of economic, demographic and technological factors on the geographical distribution of bank branches.
3. To examine the effect of socio-cultural factors on the selection of bank branches for different cities or regions.

1.5. Scope of the study

This study will be delimited to investigate Determinants of the Geographical Distribution of Bank Branches on Ethiopian commercial banks. The banks under the study will include both state owned commercial banks and private commercial banks. The study will use both primary and secondary data sources which will cover from the period of 2005-2011.



1.6. Significance of the study

The researchers will be intended to enrich and upgrade the existing literature gap specially determinants of geographical location of bank branches in Ethiopian commercial banks context by investigating the possible factors. Moreover, this study addressed itself to: researchers and commercial bank managers, specifically commercial researchers that they may gain valuable insights on the investigation of the root cause determinants of bank branches in the globalization era and serves as an input for solving problems related to determinants of selecting bank branches location. It will also help managers in private and state commercial banks to concentrate on major banking activities and make pertinent decision at right time and at the right place

2. Literature review

2.1. *Theoretical Literature*

Bank branches are considered to be the entities which fulfill the primary role of distributing financial products and services. Using very strong assumptions about the frequency distribution of the cost of establishing branches in a static model and the elasticity of profits with respect to branches, Cerasi, Chizzolini and Ivaldi (1998) were able to construct a log-likelihood function that allowed them to draw the following conclusions the industry is segmented across regions, relative to the degree of competition that prevails in each region and the marginal profitability of a branch has increased over time.

Banks differ in their organizational structure which is characterized by a bank's number of branches. The number of branches also determines the number of distinct banking markets a bank is active in, and thus reflects its level of geographic diversification (Martin Goetz, 2012). This indicates a greater degree of geographic diversification has an effect on a bank's exposure to risk of failure, and also effect on competing bank's risk taking.

An argument commonly articulated in the literature is that branch banking stabilizes banking systems by reducing their vulnerability to local economic shocks: branching enables banks to diversify their loans and deposits over a wider geographical area or customer base (Mark Carlson and Kris James Mitchener, 2005).

Since branch banking interests have sought to extend branching, the possibilities are that they have desired to secure monopoly power at the expense of unit banks, or that they have been prevented from competing by unit bank monopoly power. Professor Alhadef's classic book, *Monopoly and Competition in Banking*, was important because it cast doubt upon the conclusion that branch banks wanted more freedom to branch because they sought monopoly power (David A. and Alhadef 1954). If branch banks could compete more favorably, this in turn meant that they were more efficient than unit banks.

Comparative performance studies by Clifton H. Kreps (1964) , Irving Schweiger and John S. McGee, (1961) and Richard S. Wallace (1964) after *Monopoly and Competition in Banking* showed the same general results. Branch banks in samples compared provided more credit, lower interest, and better terms than unit banks. Differences in the composition of portfolios of

the typical branch bank and the typical unit bank were also observed: branch banks tended to have higher ratios of loans (to total assets or to total deposits), and they typically had higher ratios of business loans, consumer loans, and mortgage loans. Furthermore, branch banks sampled were found to be more profitable. But comparative performance studies depended upon data from groups of operating branch and unit banks, so no one could be sure that the observed differences in performance were not caused by differences in demand rather than superior structural features.

There can be little doubt that search and information costs have been a source of bias in explicit cost studies comparing unit and branch bank data. The role played by implicit search and information costs would not be revealed in unit bank data, because unit banks would learn to avoid them. But if search and information costs are less in branch banking, they become explicit costs precisely to the degree that they are less, because if exchanges between branch offices actually occur, the costs cannot be avoided. Hence, explicit cost comparisons may be expected to present a biased picture of the costs of branch banking

Another factor which has not been treated in the branch banking controversy is risk. Since the quantities allocated to assets in particular markets are affected by risk, its effects will be similar to those we have used in describing costs. There is ample precedent for considering the effects of risk upon the allocation of funds to various financial assets (James Tobin, 1958).

A financial asset purchased by a bank will generate two distinct types of risk. The first is earnings risk, often defined as the dispersion of earnings about the expected return (James Tobin, 1958). The second is liquidity risk, which is the risk that an asset will result in cash losses and/or deterioration in reserve positions. The notion of risk spreading, on the other hand, predicts that earnings risk is less summed over a group of branch offices than when summed for a similar group of independent unit banks, because branch offices are not individually responsible for risks (Frederick Mosteller et al. 1961).

The cost considerations introduced herein, when considered in the light of the theory also presented here, support the view that the cost studies and the comparative performance studies cited are consistent. The previous apparent inconsistency appears to have been the result of insufficient attention to search costs, information costs, and risk. We may reasonably expect that the result of branch banking would be to shift bank portfolio composition in the direction of

assets which benefit most from reductions in search costs, information costs, and risk. Furthermore, since costs in general are reduced, it would be expected that branch banks would be more profitable, and that total credit would increase. The comparative performance studies, when viewed in the light of the insights developed here, permit one to draw the conclusion that economies attaching to particular assets have been more important than those distributed over all assets alike, because we have seen assets purchased in less competitive markets increased at the expense of those purchased in more competitive markets (J. Lloyd Blackwell, 1977).

Many of the arguments that branch banks are more efficient than unit banks apply to holding company banks as well. Holding company affiliates would be expected to have the same sorts of motivations to transmit reliable information, and close relationships among affiliates would reduce search and information costs. Also, to the degree that holding company capital is used to offset risks in all held banks, the risk-spreading argument applies; and since it is possible to shift funds among affiliates, liquidity risk would also be less than in a unit bank system (J. Lloyd Blackwell, 1977). But according to Robert J. Lawrence (1967) the earnings risk reduction argument would appear to apply directly. If one looks closely, the major difference between a closely held system of holding company affiliates and a branch system is that each affiliate has its own board of directors, which probably adds to expenses. Of course, the similarity of ratio data for holding company systems and branch banks suggests similar operating conditions. Not unexpectedly, holding company systems have also appeared more expensive than unit bank systems, indicating the same difficulties experienced in branch bank cost studies.

A. Location Analysis

"People are distributed unevenly in earth space and they must obtain many kinds of goods and services from facilities located at widely separated places. They have an obvious interest in the location of these facilities being 'most accessible' to them." (Rushton, 1979, p. 31)

One of the early location models is known as the gravitational or gravity model. These models have been developed in a wide range of disciplines including economic geography, sociology, psychology, and marketing. In some cases a theory of behavior was used to supply the rationale for the gravity model, in some cases the model had no theoretical basis and was strictly empirical, and in other cases the model resulted from a direct transfer of physical science

principles into the behavioral sciences, with neither theory nor empirical reasons (Lundsten, 1978).

A second class of models is based on Applebaum's (1968) classic analog technique. This technique addresses trade area definition and market penetration. The analog model is used most effectively when a company is trying to locate a single facility or a few widely dispersed facilities over a large metropolitan area. Similar to the gravity model, the principal weakness of the analog model is that it evaluates single facilities while ignoring the effects of an entire network of sites (Chelst, Schultz, and Sanghvi, 1988).

Ingene (1984) and Mahajan, Sharma, and Srinivas (1985) have developed a third technique which draws on econometric methods of market potential estimations using multiple regression to estimate demand. Mahajan *et al.* (1985) present a "Portfolio Approach" which was developed for evaluating existing and identifying attractive potential locations for financial institutions. This approach is used for analyzing multiple-store locations.

B. Bank-Branch Location selection

Ferhan Cebi and Zeynel Zeren (2008) examine **Location Selection: Bank Branch Case using the Fuzzy-AHP model from the** strategic importance of bank branch locations. Because of the strategic importance of bank branch locations on a bank's competitiveness and performance it is suggested to the organizations to identify meaningful criteria for their location selection by assessing carefully their particular needs based on their missions and strategies.

The other point of the study that the model of the study was only based on the selecting in which city the bank should open a branch, without including the selection of specific point in the selected city for the branch. However, the location selection usually consists of a sequence of decisions from country selection to site selection, and the factors that affect them are different.

Leaving to the discretion of the locational analyst the choice of potential facility locations or candidates, the definition of the primary service area, the estimation of the proportion of the population who bank near home or work, estimates of realizable market share and growth, and final adjustments to accounts and balances (Lundsten, 1978). The American Bankers Association method suggests that analysts evaluate factors that are critical to the success of a

branch such as socioeconomic and demographic characteristics of consumers, the level of competition, and consumer expenditure patterns. In addition, there are site-specific factors such as traffic patterns, parking availability, route access, and visibility that are considered by decision-makers.

A number of different models have been employed for locating bank branches (Clawson, 1974; Littlefield, Burney, and White, 1973; Olsen and Lord, 1979; and Soenen, 1974). Clawson (1974) implements a stepwise linear regression in an attempt to more effectively screen new branch locations, set realistic performance standards for different areas, and pinpoint remedial actions for poorly performing branches.

FACTORS INFLUENCING THE DISTRIBUTION OF BANKING BRANCHES

The factors that influence banks' decisions to expand or contract the number of branches they operate and where to locate these branches include risk diversification and strategic considerations; general economic and demographic trends, including population shifts and changing business patterns; technological developments; the regulatory environment; and mergers, acquisitions, and failures.

Risk Diversification and Strategic Considerations

The potential benefits of risk diversification may provide an incentive for banks to open new branches or acquire existing branches from other institutions. By operating a geographically dispersed network of branches, an institution may achieve greater diversification of its deposit base and loan portfolio and thereby reduce the risk of substantial deposit outflows and loan losses. Further, a bank may evaluate whether to open a new office (or close an existing one) within a strategic context; that is, competitive considerations may carry some weight in an assessment of the costs and benefits associated with a particular branch.

Population, income and business activity Changes.

Changes in population, income, and business activity can influence branching patterns. The establishment of new households and the movement of many existing households, for example, have resulted in the growth of numerous suburban and rural areas as well as population declines in some urban communities. Banking institutions may respond to these population changes by



establishing new banking offices in areas experiencing growth or by closing and consolidating offices in areas of declining population.

Technological Developments

Technological developments in the delivery of banking services may affect the number and location of bank offices in two ways. First, many consumers may find alternative delivery mechanisms more convenient and less costly for many transactions, thus reducing demand for certain office services. Second, technological developments, particularly the introduction and spread of ATMs, can affect the cost of operating an office, both absolutely and relative to alternative delivery mechanisms.

Deregulation

Over the past two decades, the regulatory environment in banking has changed dramatically in the direction of deregulation. First, the removal of federal limits on the interest rates that banks could pay depositors changed the focus of competition among banking organizations from the quality and extent of services to their price.

Second, most states repealed or liberalized their laws restricting intrastate branching by commercial banks and savings associations. Third, banking organizations were largely freed from restrictions on interstate expansion by holding company acquisition or merger. The changes in the laws governing geographic expansion by banking organizations provided institutions with new opportunities to restructure and expand their banking office networks.

2.2. Empirical Literature

Study conducted by Ferhan Cebi and Zeynel Zeren (2008) on a decision support model for location selection: bank branch case indicates that banking indicators is the most important main criterion in the managers' preferences in decision for branch location selection. The criterion is followed by the Demographic, then socio-economic and regional trade potential. Sectoral distribution of employment has the lowest priority according to the decision making group's judgments on the location selection.

Study conducted by Türkay Dereli et al.(N D) on the relationship between "total deposit" and the factors (including socioeconomic and demographical factors) using A multiple regression model was determined the dependency of the total deposit to other selected factors. In view of the fact

that the determination of branching policies of the banks is a strategic matter, the regression model presented in this paper is intended to provide a decision support tool for the managers of the commercial banks as well as it can be used for the reorganization of the bank branches. It has been found that public investment amounts, GDP and population are statistically meaningful to explain the “total deposit” using multiple regression analysis, where the greatest fraction of the variation was explained by the GDP.

Using a panel data set that consists of over 2,000 markets observed from 1988 to 2004 and an estimation procedure that includes both market and year fixed effects, Timothy H. et al. (2008) estimate the relationship between market or state characteristics and the number of market branches of commercial banks and savings associations together. they report the following findings: (1) Using either market total income or market population as a measure of market size, the number of branches in a market increases, but less than proportionately, with market size. (2) Total personal income in the market appears to be much more strongly correlated with the number of market branches over time than is total population. In the case of urban markets, this is supported formally by failure to reject the hypothesis that, using a multiplicative functional form, the coefficients of the log of population and the log of income per capita are the same. (3) The rate that banks in a market are able to obtain on their interest-bearing assets is positively associated with the number of branches that they deploy in the market, all else equal. (4) Deregulation of state branching restrictions to allow full intrastate branching had a major positive effect on the number of market branches, all else equal. (5) Measures of market concentration are significantly negatively associated with the number of market branches over time, all else equal. (6) Urban areas that experienced above average increases in traffic congestion over time, all else equal, experienced above average increases in the number of bank branches—a result consistent with the predictions of basic spatial economics but perhaps reflecting other phenomena as well. (7) No consistent evidence of a relationship between migration into a market and the number of market branches over time is observed after controlling for other relevant factors.

H. Dilara Keskin and Zehra Abdioglu (2011) was investigated the relationship between bank branch location and the factors such as economic, social, cultural and demographic for Turkish sub-regions at the periods of 2004-2008. In this study, Panel regression, fixed effects and random

effects models were estimated to determine which variables have a significant effect on bank branch location. According to the regression models, the most important variables are economic variables for bank branch demand in sub-regions. Primarily, aggregated gross value, service sector, industry sector and agricultural sector are the key determinants of bank branch location in Turkey. In addition, population density positively affects the numbers of bank branches for per sub-regions. A growth in the population of sub-region increases bank branch demand related sub-region. Social variables such as the number of penalty execution institution and the number of convict have generally positive effect, but the number of traffic accident affects negatively branch location. Cultural variables unlike the others do not have any significant effect on bank branch location. These results imply that in a sub-region opening of the bank branches depend on economic growth of this region and growth in the density of population.

Luisa Alamá (2011) study on Bank branch geographic location patterns in Spain: some implications for financial exclusion using more flexible method, such as quantile regression (Koenker and Bassett, 1978; Koenker, 2001), which enables the researcher to consider the entire distribution of location patterns Suggesting that the main determinants of bank branch location are related to population and income variables.

The purpose of Ocer and Keskin's (1998) study was to put forward the effects of demographic, economic and socio cultural variables belonging to the years 1980, 1985 and 1990 effective on the geographical distribution of marketing of banking products on the number of bank branches by using econometric analysis. In their study, they concluded that all variables including population, area, income, competitiveness and financial habits have statistically significant effect on the number of deposit bank branches except for the area variable.

Charles Okeahalam (N D) studied the association between socio-economic variables and the spatial distribution of bank branches in South Africa. To analyse retail bank branch location, parametric Poisson, negative binomial, Poisson-hurdle, and finite-mixture count models that accommodate unobserved heterogeneity have been estimated with a data set of bank branches in municipalities in South Africa. The study aggregated that income in a municipal area is a statistically significant determinant of the number of bank branches. And also the results also suggest that the four core banks tend to cluster their branches in the same areas—suggesting the possibility of oligopolistic collusion. A more recent entrant locates its urban branches slightly

away from the cluster and in some areas where the core banks have no presence. In addition, several socio-economic variables, some of which are unique to South Africa, do not appear to affect branch location.

Goldberg and Grosse (1994) studied the determinants of foreign bank activity in America in terms of states and tested the effects of state laws on the entrance and growth of foreign banks using panel regression analyses. According to the experimental results of their study, the existence of foreign banks in states as measured through their offices and equities was found to be more in states with fewer restrictions for entry and with a bigger banking market. These results were also found to be valid for total foreign bank existence and foreign banking agencies, their branches and affiliates.

Calcagnini, De Bonis and Hester (1999) used a model of de novo branching of Italian banks and presented the parameter values obtained through probit regression with cross section data collected from 206 big banks between 1992 -1996. They took data about individual banks from a panel of 10 years. These data are: income statements, financial statements, merging histories and other operational statistics. In the model in their study, while explaining the de novo branching in one region, they used data about the bank's own operating system characteristics together with the banking market in that region and economic activities. The main findings in their study are as such: 1) The existing market structure and recent branch expansions are strongly effective on de novo branching, 2) Banks seek targets which offer opportunities when many groups at their operating area cannot reach services and when the income per branch is low, 3) There is only a weak relationship between the income per capita level of the region, its change and de novo branches, 4) The possibility for merger banks to have a de novo branch is higher than other banks, 5) The possibility of having de novo branches is higher for banks which occupy more staff at their branches and which give more loans compared to deposits.

Ozturk (2000) aimed in his study to determine the effects of socio-economic factors influential on the geographical distribution of bank branches in Turkey and their degree of influence. With this purpose, he determined the number of branches for 10 big deposit banks in Turkey at city scale between 1980- 1995 and included them in the analyses. He concluded that factors such as population, level of education and person per meter square are influential on the number of bank branches.

According to Zhao, Garner and Parolin (2004) bank branch closures in Australia and elsewhere is an important component of cost reducing and profit maximization strategy which is currently applied. The most important measure of the efficiency of branches is usually financial performance. However, there is also evidence that more general factors are also influential in determining branch potential. Zhao, Garner and Parolin (2004) used Geographical Information System procedures and functions to convert general factors to specific spatial criteria, targeted the problem of bank closure by producing a spatial decision support system and with this system tried to evaluate individual branches and aid decision makers to form a list of preferences to determine the branches which are candidates for closure. Their variables consists of two groups of sub-criteria with are 9 catchment variables (banking population, population growth rate, average annual family income, average age, aged population, employed people, total number of small businesses, competitors' branches and catchment area) and 8 location variables (small business in 200m travel zone, competitor branches in 200m buffer, working population in 200m travel zone, Commonwealth Bank of Australia (CBA) branches in 500m buffer, CBA branch at shopping centre, shopping centers within 500m buffer, accessibility index and proximity to public transport). According to the results of the study, if spatial criteria are also added into the decision making process as well as financial influences, the decisions for bank branch closures will be enhanced.

Chapter Three: Research design and methodology

3.1 Introduction

This chapter presents the research approach adopted in the study. It explains in detail the pros and cons of the research methodology utilized and its justification for the purposes of this study. It also outlines the strategies employed to collect data as well as the challenges, limitations and/or constraints which were experienced. It further addresses issues of reliability and validity.

3.2. Variable Definitions

The dependent variable is the number of branches for eight commercial banks in Ethiopia. The variable of bank branches was calculated by aggregating the number of bank branches in each region. The variables of economic, social-cultural and demographic are presented in Table 3.1.

Table 3.1 Definition of Variables and expected sign.

Economic variables	Notation	Expected sign
Gross added value of the manufacturing sector	ECOGAVMS	+
Number of firms in the manufacturing, service and agricultural sectors	ECONF	+
Number of employees in the manufacturing, service and agricultural sectors	ECONE	+
Government capital expenditure	ECOGCE	+
Real GDP per capita	ECORGDPPC	+
Social-cultural variables		
Number of crimes recorded	SCNCR	-
The Number of Vocational Training School and Undergraduate Students	SCNVTSUS	+
Demographic Variables		
Population growth rate	DGPGR	+
Population Density [Population/km ²]	DGPD	+
Dependent Variable		
The Number of Aggregate Bank Branches	NABB	

3.3. Research Design

Based on the purpose and objectives of the study, the necessity to crystallize the research questions became apparent, the researcher used both quantitative and qualitative research approaches.

The qualitative approach helps the researchers to find and build theories that explain the relationship of one variable with another variable through qualitative elements in research. Through this method, qualitative elements that do not have standard measures such as behavior, attitudes, opinions, and beliefs were analyzed.

The quantitative approach used to quantify the impact of economic, social, cultural and demographic factors on geographical distribution of bank branches. The reason we use both quantitative and qualitative research approaches because this permits us to adopt a flexible and iterative approach. Moreover; the descriptive research method was utilized.

3.4. Source of Data

In this study the searchers used more of secondary data. The secondary data were collected from published and unpublished documents, central statistical agency, ministry of finance and economic development, national bank of Ethiopia, World Bank, and other organization which have and provide relevant information about economic, socio-cultural, technological and demographic variables of different regions to achieve objective of this study. To support the secondary data and to get reliable information primary data were used. The primary data were gathered from managers and higher officials of Ethiopian commercial banks which started their operation before the year 2005.

3.5. Methods of Data Collection

The Primary data were gathered using unstructured interview with the Ethiopian commercial banks higher officials who start their operation before the year 2005. The other technique that used to collect data was document analysis, in particular to collect secondary data. The types of secondary data gathered include economic, socio- cultural, technological and demographic variables of different regions and other relevant documents.

3.6 Sample, Sample Size and Sampling Technique

Now days there are more than 15 private and public commercial banks that have been providing banking service in our country. But those banks that start their operation before the year 2005 were only 8 commercial banks. The sample for this study will be selected from 8 commercial banks based on their age, number of branches, and availability of data given the nature of the study. In line with this, to collect the primary data through unstructured interview the researchers under took two professionals (higher officials) from each bank pertaining to the data availability, so that the total sample size will be 16 professionals (higher officials) who have a direct relationship with bank branch expansion decisions.

3.7. Methods of Data Analysis

When the entire secondary documents have been collected, the researchers will use different methods to analyze all the data. The researchers will use econometric model to analyze the relationship between number of bank branches in different region and economic, socio-cultural, technological and demographic factors to identify which factors highly influence the decision of bank branches location selection.

The researchers will also assisted by the STATA to examine the influence of economic, socio-cultural, technological and demographic variables on the decision of bank branches location selection.

3.8. Panel Data Model

To examine the influence of economic, social-cultural and demographic variable on decision of bank branch location selection over time panel regression models were used in this study. There are several types of panel models, such as constant coefficients model, fixed effects models and random effects models. In constant coefficients models both intercepts and slopes have constant coefficients. For this model all of the data are pooled and run an ordinary least squares regression model. In fixed effects models slope coefficients constant but intercept varies across individuals. In fixed effects models the individual-specific effect is a random variable that is allowed to be correlated with the explanatory variables. In random effects models, the individual-specific effect is a random variable that is uncorrelated with the explanatory variables.

To examine the relationship between economic, social-cultural and demographic variables and bank branches in different regions, we formulate the following panel data regression;

$$NABBit \equiv \alpha \pm \sum \delta ECOit \pm \sum \theta SCit \pm \sum \varphi DMit \pm \varepsilon it$$

Where

NABBit = the dependent variable; the number of aggregate bank branches in region 'i' at time't'.

α = the intercept (constant)

ECOit = economic determinants of region 'i' at time't'.

SCit = socio-cultural determinants of region 'i' at time't'.

DMit = demographic determinants of region 'i' at time't'.

δ, θ, φ = the coefficients

εit = the error term

Testing the CLRM assumptions

1. Normality of the error term

One assumption of classical regression model is the normal distribution of the residual part of the model. To test whether a single univariate sample differs significantly from a normal distribution, use the Shapiro-Wilk test.

Table 3.2 residual normality test of the model

Variable	Shapiro-Wilk W test for normal data				
	Obs	W	V	z	Prob>z
nbb	77	0.72681	18.174	6.340	0.00000

Source; researchers' own computation, 2011/12

The above table 3.2 indicates the normality test of the residual part of the model. The P-value of zero predicts the residual of the model is not normally distributed that violates the CLRM assumption. However, the central limit thermo assumes that the distribution of error term normal as the number of observation is large. This model has large number of observation and therefore, no need to worry about the normality of the error term.

2. Heteroscedasticity

The assumption of homoscedasticity states that the variance of the errors held constant. If the errors do not have a constant variance, they are said to be heteroscedastic. The Breusch-Pagan test was employed to detect any linear form of heteroscedasticity.

Table 3.3 Heteroscedasticity test

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity		
Ho: Constant variance		
Variables: fitted values of nbb		
<hr/>		
chi2 (1)	=	27.88
Prob > chi2	=	0.0000

The above table 3.3 indicates the normality test of the residual part of the model. The P-value of zero would indicate that heteroscedasticity was present. When heteroskedasticity is present, robust standard errors tend to be more trustworthy. Therefore, the researchers used robust standard errors to estimate the coefficients in the model and to control for heteroskedasticity.

3. Multicollinearity

An implicit assumption that is made when using the CLRM models is that the explanatory variables are not correlated with one another. If there is no relationship between the explanatory variables, they would be said to be orthogonal to one another. In any practical context, the correlation between explanatory variables will be non-zero, although this will generally be relatively benign in the sense that a small degree of association between explanatory variables will almost always occur but will not cause too much loss of precision. However, a problem occurs when the explanatory variables are very highly correlated with each other, and this problem is known as multicollinearity. This problem can be tested using pair-wise correlations and variable inflation factor (vif).

a. Pearson correlation coefficient matrix

In this table, table 3.4, if there exist high value of coefficient (more than 0.80), it indicates the existence of more colinierty between the variables. The more colinearity between the explanatory variables exits, the more the Multicollinearity becomes the problem.

Table 3.4 Pearson correlation coefficient matrix

Variables	nbb	dmgpg	ecoep	socatvt	socancc	econfm	ecogce	ecorgdp	loggva
nbb	1.0000								
dmgpg	-0.0481	1.0000							
ecoep	0.4867	-0.1381	1.0000						
socatvt	0.8106	-0.0793	0.5419	1.0000					
socancc	0.8130	-0.1331	0.6977	0.7616	1.0000				
econfm	0.9057	0.0213	0.2563	0.6983	0.6591	1.0000			
ecogce	0.7813	-0.0308	-0.0616	0.5019	0.4490	0.7946	1.0000		
ecorgdp	0.1009	-0.0147	-0.3200	0.1015	-0.0543	0.1947	0.2434	1.0000	
loggva	0.6829	-0.3060	0.4765	0.6039	0.7456	0.6326	0.4286	0.2400	1.0000

in the above table any of them are below 0.80 and it can be confident to say there is no significant multicollinearity problem in this model.

b. Variance inflation factor (VIF) test

The VIF shows us how much the variance of the coefficient estimate is being inflated by multicollinearity. A commonly given rule of thumb is that VIFs of 10 or higher (or equivalently, tolerances of .10 or less) may be reason for concern.

Table 3.4 variance of inflation factor (VIF) test of Multicollinearity

Variable	VIF	1/VIF
socancc	5.51	0.181350
econfm	5.07	0.197392
ecogce	3.85	0.260019
ecoep	3.61	0.276698
loggva	3.48	0.287505
socatvt	3.16	0.316754
ecorgdp	1.54	0.647636
dmgpg	1.26	0.793454
Mean VIF	3.43	

Table 3.4 shows the variance of inflation factor (VIF) all are less than 10 predicts explanatory variables are not highly correlated with each other. Therefore, there is no the problem of Multicollinearity in this model.

4. Model specification test

A model specification error can occur when one or more relevant variables are omitted from the model or one or more irrelevant variables are included in the model. If relevant variables are omitted from the model, the common variance they share with included variables may be wrongly attributed to those variables, and the error term is inflated. On the other hand, if irrelevant variables are included in the model, the common variance they share with included variables may be wrongly attributed to them. Model specification errors can substantially affect the estimate of regression coefficients.

Link test

The linktest command performs a model specification link test for single-equation models. linktest is based on the idea that if a regression is properly specified, one should not be able to find any additional independent variables that are significant except by chance. linktest creates two new variables, the variable of prediction, `_hat`, and the variable of squared prediction, `_hatsq`. The variable `_hat` should be a statistically significant predictor, since it is the predicted value from the model. This will be the case unless the model is completely misspecified. On the other hand, if our model is properly specified, variable `_hatsq` shouldn't have much predictive power except by chance. Therefore, if `_hatsq` is significant, then the **linktest** is significant. This usually means that either we have omitted relevant variable(s) or our link function is not correctly specified.

Table 3.5 link test for model specification

Source	SS	df	MS			
Model	413669.232	2	206834.616		Number of obs =	77
Residual	15706.7156	74	212.252913		F(2, 74) =	974.47
Total	429375.948	76	5649.68353		Prob > F =	0.0000
					R-squared =	0.9634
					Adj R-squared =	0.9624
					Root MSE =	14.569

nbb	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
<code>_hat</code>	.9514768	.0547755	17.37	0.000	.8423342	1.060619
<code>_hatsq</code>	.0002037	.0002093	0.97	0.334	-.0002134	.0006207
<code>_cons</code>	.9358583	2.277072	0.41	0.682	-3.601308	5.473024

From the above linktest, the test of `_hatsq` is not significant. This is to say that linktest has failed to reject the assumption that the model is specified correctly. Therefore, our model is correctly specified.

5. Model selection test

The challenge facing a researcher is: Which model is better, fixed effect or random effect? The answer to this question hinges around the assumption one makes about the likely correlation between the individual, or cross-section specific, error component ϵ_i and the regressors. To choose the better model, we made Hausman test. The null hypothesis underlying the Hausman test is that the FE and RE estimators do not differ substantially. The test statistic developed by Hausman has an asymptotic χ^2 distribution. If the null hypothesis is rejected, the conclusion is that RE is not appropriate and that we may be better off using FE model otherwise RE model.

```
hausman fe re
```

	---- Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fe	re	Difference	S.E.
dmgpg	21.49446	31.65099	-10.15653	.
ecoep	.0000283	5.62e-06	.0000226	6.53e-06
socatvt	.0000869	.000215	-.0001281	.0000153
socancc	.0002733	.0001627	.0001106	.0000752
econfm	.0584584	.0851193	-.0266609	.0077192
ecogce	2.63e-08	2.20e-08	4.32e-09	1.43e-09
ecorgdp	-.002456	-.0009812	-.0014748	.0024583
loggva	2.871877	3.101916	-.2300392	2.023995

Notes; Wald chi2 (8df) = 15.94; Prob>chi2 =0.0031

In the above table, the Hausman test shows that the Prob > Chi2 = 0.0031 which is significant and we have evidence to reject the null hypothesis and the appropriate estimation is, therefore, the fixed effect.

Chapter Four: Data Analysis and Presentation

4.1 Descriptive Statistics of the Variables

Table 4.1 reports the descriptive statistics of the variables used in this study. The average aggregate number of bank branches of the region over the study period from 2005 to 2011 was 54. The maximum number of aggregate bank branches in region was about 352 while the minimum was only 1. This indicates the Ethiopian commercial banking system has been characterized by a higher degree of regional overlap (over concentration in one or two regions). The mean of the population growth rate the regions was 3.4%. The maximum population growth rate of the regions was about 26.9% while the minimum was -9.96%.

Table 4.1 summary of descriptive statistic of study variables

Variable	Obs	Mean	Std. Dev.	Min	Max
nbb	77	54.11688	75.16438	1	352
dmgpg	77	.0339563	.0394782	-.09968	.26936
ecoep	77	3007300	4439671	7196	1.50
socatvt	77	23236.29	30127.24	66	100840
socancc	77	19502.78	20625.73	234	63367
econfm	77	221.7507	336.5061	2	1596
ecogce	77	412000000	1010000000	8350000	5,828,457,600
ecorgdp	77	2213.986	1547.968	812.1	6857.8
loggva	77	7.873501	1.232207	4.54083	9.901

Source: Panel estimates: 2005 – 2011

The mean of the regions employed population, TVET and higher education students, number of crime recorded, number firms in manufacturing, service and agricultural sectors, government capital expenditures and real GDP per capita 3007300, 23236, 19502, 221, 412000000 and 2213.986 respectively. The average value of log of the aggregate growth added value of the regions was 7.87.

4.2 Regression Result Analysis

This section presents the empirical result analysis using the pooled OLS and fixed effect models of the sample bank panel data. Here, we discussed the direction and the significance of

dependent variables coefficients. The following tables represent the summary of the regression results of dependent and independent variables.

Table 4.2 summary of the regression results using Pooled OLS model

nbb	Coef.	Robust Std. Err.	t	P>t	[95% Conf. Interval]
dmgpg	38.75602	37.02867	1.05	0.299	-35.13355 112.6456
ecoep	4.89e-06	1.22e-06	4.02	0.000*	2.46e-06 7.32e-06
socatvt	.0003119	.0001217	2.56	0.013**	.000069 .0005548
socancc	.0004346	.0003228	1.35	0.183	-.0002096 .0010788
econfm	.0762903	.0219627	3.47	0.001*	.0324644 .1201162
ecogce	3.07e-08	6.13e-09	5.01	0.000*	1.85e-08 4.29e-08
ecorgdp	.0009342	.0011282	0.83	0.411	-.0013171 .0031855
loggva	-.6675435	2.228774	-0.30	0.765	-5.114994 3.779907
_cons	-4.140829	13.85995	-0.30	0.766	-31.79793 23.51627

Number of obs = 77 R-squared = 0.9636; Prob > F = 0.0000

Source: Panel estimates: 2005 – 2011

Notes; * indicates significant at 1 percent and ** indicates significant at 5 percent

Government capital expenditures, number of employed people and number of firms operating in each region have a significant and positive impact on the geographical distribution of commercial bank branches in Ethiopia as measured by aggregate number of bank branches in each region. This result is consistent with Luisa et al. (2011) they found a positive significant relationship between these variables and bank branch expansion. Therefore, they stated that, the higher level of these variables increase the financial service accessibility which measured by number of bank branches available. Real gross domestic product has positive relationship with bank branch distribution but not significant. However, there is a negative relationship between aggregate gross added value and bank branch distribution. This result is inconsistent with H. Dilara Keskin (2011) who found a positive and significant impact on bank branch expansion.

From the demographic variables, annual population growth rate has a positive on the geographical distribution of commercial bank branches in Ethiopia. From social variables, The Number of Vocational Training School and Undergraduate Students has a significant positive impact on distribution of bank branches but there is a negative and significant relationship

between the number of traffic accident and bank branch distribution. This result is contradictory to the empirical evidences which are conducted in developed countries such as H. Dilara Keskin (2011), this is because, the nature Ethiopian banking branch distribution which is highly concentrated in urban areas which have a record of large number of traffic accidents.

According to Pooled OLS regression result, the most effective variables are economic and social variables on aggregate number of bank branches in each region. The explanatory power of panel regression equation ($R^2=0.9636$) is high and F statistics is significant at the 1 percent level.

Table 4.3 summary of the regression results using fixed effect model

nbb	Robust					
	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
dmgpg	21.49446	29.02082	0.74	0.462	-36.59701	79.58594
ecoep	.0000283	.0000124	2.28	0.026*	3.47e-06	.000053
socatvt	.0000869	.0001194	0.73	0.470	-.0001521	.0003259
socancc	.0002733	.0003208	0.85	0.398	-.0003688	.0009154
econfm	.0584584	.0136536	4.28	0.000**	.0311278	.085789
ecogce	2.63e-08	4.91e-09	5.36	0.000**	1.65e-08	3.62e-08
ecorgdp	-.002456	.0025591	-0.96	0.341	-.0075785	.0026665
loggva	2.871877	3.511765	0.82	0.417	-4.157684	9.901438
_cons	-79.90598	41.83025	-1.91	0.061	-163.6383	3.826359

R-sq: within = 0.8956

Prob > F = 0.0000

Source: Panel estimates: 2005 – 2011

Notes; * indicates significant at 1 percent and ** indicates significant at 5 percent

R^2 is a popular measure of goodness of fit in ordinary regression. In the fixed effect panel data regression, it's reported *within* R-square in the R^2 that obtained by running in the OLS regression. Thus, from the above table 4.3, it can be indicated that, for this fixed effect model, the R^2 square value of 89.56 percent of variation in aggregate number of bank branches in each region is explained by the variation in explanatory variables and the rest (10.44 percent) are captured by residual of the model. Thus, the explanatory power of panel regression equation (R^2) is high. In addition, the overall model is capable enough to explain and predict the variation of aggregate number of bank branches in each region as a function of explanatory variable as it can be observed from *small P-value* of the *F-statistics* at 1 percent level of significance.

The annual population growth rate has a positive and insignificant effect on the geographical distribution of commercial bank branches in Ethiopia as measured by aggregate number of bank

branches in each region. This result is consistent to the empirical evidences of Timothy et al. (2008) , they found a positive coefficient of annual population growth rate, as market increase in population, more branches are established in the market. And also, similar with Luisa et al. (2011) finding and thy stated that, the higher level of population could contribute to increasing the number of bank branches via the increased demand for bank services.

From the economic variables, number of firms and government capital expenditures are extremely significant and positive effect on the geographical distribution of commercial bank branches. This indicates the higher the number of firms and the large amount of government expenditure in the region, the higher the number of aggregate bank branches in that region. This result consistent with Turkey et al (2010) study, found that public capital investment is statically meaningful to explain geographic distribution of bank branches. And also the number of employed population has a positive and significant effect on the geographical distribution of commercial bank braches. This proves that the higher the number of employed population in the region, the higher the number of aggregate bank branches in that region. The aggregate gross added value has positive relationship with the aggregate number of bank branches in each region but not significant. Even if there are empirical evidence that support for arguments that banks seek to open new branches in are where per capita GDP is higher or rising, but in our model, real GDP per capita is found to have an insignificant negative impact on the geographical distribution of commercial bank branches in Ethiopia.

In this model, The Number of Vocational Training School and Undergraduate Students has a positive relationship with distribution of bank branches but not significant. There is a positive relationship between the number of traffic accident and bank branch distribution. This result is contradictory to the empirical evidences which are conducted in developed countries such as H. Dilara Keskin (2011) but consistent with Timothy (2008). Urban areas that experienced above average increases in traffic congestion over time, all else equal, experienced above average increases in the number of bank branches a result consistent with the predictions of basic spatial economics but perhaps reflecting other phenomena as well (Timothy, 2008). And also the nature Ethiopian banking sector branch distribution is highly concentrated in urban areas which have a record of large number of traffic accidents. According to fixed effect model, the most explanatory variables are economic variables.

Chapter Five: Conclusions and Recommendation

5.1. Conclusions

The Ethiopian banking system shows a rapid increase after the 1991 financial liberalization. But the numbers of branches are very small when we relate with the total population and compare with other developing countries. Thus, mainstream bank branches are hardly accessible to rural poor. Moreover, the Ethiopian banking system has been characterized by a higher degree of regional overlap (over concentration in one or two cities or regions).

But expansions of more bank branches are very important in least developing countries like Ethiopia to provide face to face banking service because in these countries there is no access of modern banking technology to use unit banking and the people are less literate. Thus, the banking sector in Ethiopia has trying to provide financial services more geographically widespread and accessible by increasing the number of branches and staff. Ethiopia has many regions with very diverse developmental levels and the geographical distribution of the banking sector also shows a variety depending on the differences between the developmental levels of regions.

Bank branch location carries strategic significance for the performance and service quality of banks and determining which factors affect branch location more is highly important. And also, another important empirical question is the associations between bank branching and financial service accessibility. In this respect, the relationship between bank branch location and economic, so-cultural and demographical factors was empirically investigated for 11 regions of Ethiopia for the period between 2005-2011.

For undertaking the analysis, we adopt a point of view which considers that the variables affecting the number of aggregate bank branches in each region. In order to estimate the effect of these variables on the distribution of bank branches, we used the pooled OLS and fixed effect models.

According to the regression models, the important variables are the economic and social variables. Primarily government capital expenditure, number of employed population, number of firms in all sectors and the Number of Vocational Training School and Undergraduate Students are important determinants of the geographical distribution of bank branches in Ethiopian

commercial banking sector. In addition, annual population growth rate positively affects the aggregate numbers of bank branches in each region (increases bank branch demand related region). But GDP per capita and aggregate growth added values of all sectors have insignificant impact on the distribution of bank branches. From Social variables, the number of traffic accident has a positive relationship with the distribution of bank branch in each region. This result implies that in a region opening of the bank branches depend on economic growth (particularly government capital expenditure, number of employed population and number of firms in all sectors of the economy) of this region and growth in the Number of Vocational Training School and Undergraduate Students.

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