ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

EFFECTS OF ECONOMIC POLICY UNCERTAINTY ON CREDIT RISKS AND BANKS' LENDING DECISIONS: EVIDENCE FROM ETHIOPIAN COMMERCIAL BANKS

BY

FANUEL GIZAW

JULY, 2023

ADDIS ABABA, ETHIOPIA

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

EFFECTS OF ECONOMIC POLICY UNCERTAINTY ON CREDIT RISKS AND BANKS' LENDING DECISIONS: EVIDENCE FROM ETHIOPIAN COMMERCIAL BANKS

BY

FANUEL GIZAW

A Thesis Proposal Submitted to the School of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirements for the Award of Master of Science Degree in Economics (Economic Policy Analysis)

JULY, 2023

ADDIS ABABA, ETHIOPIA

Addis Ababa University

School of Graduate Studies

This is to certify that the thesis prepared by Fanuel Gizaw Getahun, entitled: ***Effects of Economic Policy Uncertainty on Credit Risks and Banks' Lending Decisions: Evidence from Ethiopian Commercial Banks*** and submitted in Partial Fulfillment of the Requirements for the award of Master of Science Degree in Economics (Economic Policy Analysis) complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Signed by examining committee:

Examiner Missina A. Signature _____ Date _____

Examiner Jenbera Leulie Signature _____ Date _____

Advisor Dr. Befekadu _____ Signature _____ Date _____

DECLARATION

I, the undersigned, declare that this thesis is my original work, and prepared for the first time using our own knowledge and understanding. Besides all sources and information used in this paper are carefully acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institution for the purpose of earning any degree.

_____ _____

Name Signature

Addis Ababa University,
Addis Ababa, Ethiopia
July, 2023

ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to my advisor, Professor Befekadu Degife, for his invaluable guidance, suggestions, technical supports, constructive comments and good welcoming approach in every step of my effort from the beginning to the end of the study.

I would like to express my sincere gratitude to God, our Heavenly Father, for His divine guidance and blessings throughout my life. I acknowledge that all wisdom and knowledge come from Him, and I am thankful for His grace and mercy. I also extend my heartfelt thanks to the Holy Virgin Mary, the Mother of God and the intercessor of all Christians. May the glory and love of God shine upon all those who have contributed to this study.

Finally, I would like to acknowledge my family and friends for their unwavering support and encouragement throughout this research. Their love and encouragement have been a constant source of inspiration, and I am grateful for their presence in my life.

Acronyms

AB	Awash Bank
BoA	Bank of Abisinia
CAR	Capital Adequacy Ratio
CBE	Commercial Bank of Ethiopia
COOP	Cooperative Bank of Oromia
CPI	Consumer Price Index
DB	Dashin Bank
DBE	Development Bank of Ethiopia
EIU	Economist Intelligence Unit
EPU	Economic Policy Uncertainty
EU	European Union
FE	Fixed Effect
FEM	Fixed Effect Model
GDP	Gross Domestic Product
GL	Growth Rate of Loan
HB	Hibret Bank
INFR	Inflation Rate
LIB	Lion International Bank
LIR	Loan Interest Rate
LM	Lagrangian Multiplier
LTDR	Loan to Deposit Ratio
NBE	National Bank of Ethiopia
NPL	Non Performing Loan
NPLR	Non Performing Loan Ratio
OB	Oromia Bank
RE	Random Effect
REM	Random Effect Model
SIZE	Bank Size
UNR	Unemployment Rate
WB	Wogagen Bank

Table of content

Contents page

List of tables

Abstract

The objective of this study is to explore the effects of economic policy uncertainty on credit risk and lending decision of 12 Ethiopian commercial banks for the period spanning from 2010–2021. In order to analyze the relationship between credit risk measured by non performing loan ratio and lending decisions measured by growth rate of loan and economic policy uncertainty controlled bank specific and macroeconomics variables, the study employed two fixed effect (within) panel regression Models. The empirical results revealed that economic policy uncertainty has a significant positive effect on credit risk (nonperforming loan ratio), and a significant negative effect on lending decisions (growth rate of loan). Furthermore, bank size and gross domestic product have significant negative relation with non performing loans and have significant positive relationship with growth rate of loans. However, lending interest rate has a significant positive relationship with nonperforming loan and has a significant negative link with lending decision of Ethiopian commercial banks.

***Key words**: Economic policy uncertainty, nonperforming loan, lending decision, credit risk, commercial bank, fixed effect*

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Governments formulate various policies, such as fiscal, monetary, industrial, agricultural, financial, and administrative policies, to regulate and manage the economic operation and behavioral patterns of market participants and to achieve good governance. According to McGrattan (2005), government economic policies can have a significant impact on entire countries' economies. When government policies are consistent, uncomplicated, smooth, and knowable, firms, businesses, and individuals can make valid and ideal decisions. However, uncertainty related to government policies can have serious implications for both the financial and real sectors. This uncertainty is often referred to as economic policy uncertainty and can be driven by various factors, as suggested by Feng (2001), Le and Zak (2006), and Pastor and Veronesi (2013). These factors include frequent policy changes introduced by governments, the possibility that governments might take a position opposing policies in enforcement, and new policies enforced by private sector profits.

Rice (2020) suggests that a significant portion of economic policy uncertainty may stem from abroad, especially for small open economies. Therefore, it is essential to identify and address sources of economic policy uncertainty to promote stable economic growth and good governance.

Economic policy uncertainty can have significant adverse effects on economic growth, leading to falling output, employment, and investment (Baker et al., 2013). Additionally, high levels of policy uncertainty are associated with weaker economic prospects. The unpredictability of asset and alternative markets also increases with rising economic policy uncertainty, which can steepen the yield curve (Ulrich, 2012). Share prices become more unpredictable as well, which can impact businesses' behavior and operations (Pastor and Veronesi, 2013). An increase in economic policy uncertainty, particularly in economic policies, can slow down enterprise and household investment, employment, and consumption (Tao and Xu, 2019).

In Ethiopia, the banking sector plays a crucial role in the economy's development and promotion, as stated in NBE Proclamation No. 592/2008. The mobilization of funds and channeling of these funds to various sectors of the economy are essential functions of banks. As one of the primary financial pillars in the country, the banking sector provides the necessary financial inputs to produce goods and services, promoting people's well-being and standard of living. Moreover, it enables the transfer of resources from savers to investors, facilitating economic growth and development in Ethiopia.

Financial institutions play a crucial role in the economy by converting primary securities issued by deficit units into secondary securities that are less risky, more liquid, and more useful to surplus units. However, as noted by Gissler, Old Father, and Ruffino (2016), financial institutions are sensitive to and hostile toward uncertainty, particularly with regards to economic policy. When policy uncertainty is high, banks may cut back on lending, which can lead to reduced liquidity for firms and households. This can result in reduced consumption, investment, and expenses as they become more vigilant about their finances. Banks may also be less willing to extend financing due to uncertainty about the viability of initiatives (Diamond and Rajan, 2011).

Unexpected regulatory interventions can also contribute to uncertainty and encourage financial institutions to reduce lending and excessive risk-taking. Banks may reduce or limit lending due to liquidity problems, capital positions, government fiscal and monetary policies, and bank health, as highlighted by Zewudu (2010). During a recession, banks tend to reduce credit supply, leading to an increase in the cost of capital (Ozili, 2022). Reduced credit supply can also lead to decreased loan growth, eventually resulting in decreased bank performance, as noted by Bordo et al. (2016). Moreover, political interference can depress the performance of government banks, as shown by Shen and Lin (2012).

High policy uncertainty can also result in banks increasing their interest rates when lending money (Ashraf and Shen, 2019). This sharp increase in interest rates can lead to a deterioration of the borrower's repayment capacity, resulting in an increase in non-performing loans (Nkusu,

2011). Therefore, reducing policy uncertainty is crucial for promoting stable economic growth and maintaining a healthy financial sector.

Bank lending plays a significant role in the process of economic growth as it affects real GDP per worker through its role in domestic capital accumulation and efficient resource allocation. As Khan and Senhadji (2000), bank loans can help businesses become stable, develop their operations effectively, produce profits, and contribute to the development of the entire economy. Therefore, it is crucial to create suitable conditions for banks to perform their activities effectively and reduce risks, leading to improved performance (Muneeb, 2021). The efficiency of bank lending facilities in major economic sectors also plays a vital role in Ethiopia's economic growth (Abdi, 2017). Hence, policies should be designed to encourage further development in bank lending and the integration of the finance sector with other governmental institutions to improve Ethiopia's economy (Fikremarkos, 2021).

The study aims to address a gap in the existing literature by exploring the relationship between economic policy uncertainty and credit risks, an area that has not been extensively studied in the Ethiopian context. The title suggests that the study will investigate how economic policy uncertainty affects the lending decisions of commercial banks in Ethiopia, which is crucial for policymakers and regulators to understand. The findings of the study could help policymakers design effective policies to promote lending activity and manage credit risks, thereby contributing to the development of the financial sector and the overall economy in Ethiopia.

1.2 Statement of the Problem

Economic policy uncertainty has had a detrimental impact on investment, economic growth, household consumption, and the competitiveness of Ethiopia's economy. Studies have shown that policy uncertainty negatively affects both foreign and domestic private investment, particularly in the manufacturing sector, and has a stronger impact on foreign investors (Henok and Moti, 2021). Additionally, policy uncertainty has contributed to slower economic growth, particularly during periods of political unrest (Abel and Arega, 2019). The negative effects of policy uncertainty extend to household consumption, as uncertainty about government policies and regulations can lead to reduced consumer confidence and spending. Furthermore, policy uncertainty can decrease the competitiveness of Ethiopia's economy by discouraging foreign investment and trade (Yohannes and Tadesse, 2021).

Banks face several risks while making profits, with default risk being one of the most significant risks in the current context. An increase in non-performing loans (NPLs) due to default risk can lead to a reduction in liquidity, disruption of resource allocation, and ultimately the reduction of bank profits, as noted by Ghasemi (2010). Non-performing loans have been a hindrance to the economic stability and growth of economies, as highlighted by Beck (2001).

In Ethiopia, the credit business is a key income-generating activity for many banks, with over 60% of their income derived from credit businesses, as noted in various issues of the Annual Reports of the Commercial Banks. However, a sound financial system requires a minimum level of non-performing loans to facilitate the economic development of a country. Excess lending to state-owned enterprises, a less healthy monitoring system of banks, and the inefficiency of state-owned enterprises in undertaking investment projects create significant risks for banks. For instance, as of 2018, the non-performing loans (NPLs) of the Development Bank of Ethiopia (DBE) had reached 40%, indicating the severity of the problem. Although banks' loan collection abilities in Ethiopia have increased over time, the average has not reached the amount required by the National Bank of Ethiopia. As of 2021, non-performing loans as a percentage of all bank loans of Ethiopian banks reached 5.41%, surpassing the maximum NPL set by National Bank of Ethiopia Directive No.SBB/69/2018, which states that banks found in the country are required to maintain a ratio of their non-performing loans below five percent. Therefore, managing credit risks and reducing non-performing loans is crucial for the stability and growth of the Ethiopian economy.

Previous research has mainly focused on the relationship between economic policy uncertanity and credit risk in developed countries, with limited studies conducted in developing countries such as Ethiopia. In Ethiopia, a few studies have been conducted on the determinants of credit risk and lending decisions, with a focus on factors such as non performing loans and their causes.

For instance, Daniel (2010) found that nonperforming loans in private commercial banks in Ethiopia were caused by factors such as moral hazard of borrowers, ineffective monitoring, and operational losses. Similarly, Wondimagegnehu (2012) investigated the determinants of nonperforming loans and found that poor credit assessment, failed loan monitoring, and weak institutional capacity contribute to bad debts. Anisa (2015) examined the determinants of

nonperforming loans in eight Ethiopian commercial banks and identified deposit rates, loan-to-deposit ratios, and lending interest rates as significant factors. Berhanu (2016) investigated the determinants of lending decisions by private Ethiopian commercial banks and found that liquidity ratio, capital adequacy ratio, inflation rate, and gross domestic product had a positive impact on banks' lending.

The existing empirical investigations mainly focused economic policy uncertainty effect on firms other than financial institutions and bank-specific factors that intensify non-performing loans and reduce lending decisions. Even if the Ethiopian banking sector has experienced significant growth in recent years, it remains vulnerable to external shocks and macroeconomic instability. Economic policy uncertainty is one such factor that can have significant implications for the banking sector, potentially affecting banks' lending decisions and credit risks. Despite the importance of this issue, there is a lack of empirical research on the effects of economic policy uncertainty on credit risks and banks' lending decisions in Ethiopian commercial banks. Therefore, the purpose of this study is to investigate the effects of economic policy uncertainty on credit risks and banks' lending decisions in Ethiopian commercial banks, using a panel data analysis approach.

1.3 Basic Research Questions

i. What are the mechanisms by which economic policy uncertainty operates and its effect on non-performing loan ratios of Ethiopian commercial banks?
ii. What are the effects of economic policy uncertainty on lending decisions of Ethiopian commercial banks?

1.4 Objective of the Study

1.4.1 General Objective

Drawing from the aforementioned problems, the general objective of this study is to examine the effects of economic policy uncertainty on banks’ credit risks (non-performing loans) and lending decisions of Ethiopian commercial banks.

1.4.2 Specific Objective

I. Find out whether policy uncertainty affects banks' credit risks (non-performing loans) in Ethiopian commercial banks.
II. Determine the effects of policy uncertainty on lending decisions in Ethiopian commercial banks.

1.5 Hypothesis

The study has proposed the subsequent operational hypotheses to be valid in this investigation:

H1: The degree of credit risk Ethiopian commercial banks face is positively impacted by the state of economic policy uncertainty.

H2: The lending decision of Ethiopian commercial banks is declined as economic policy uncertainty rises.

1.6 Significance of the Study

Commercial banks in Ethiopia play a critical role in the transmission mechanism of official macroeconomic policies, given their function of channeling the effects of governmental macroeconomic control. However, economic policy uncertainty can have an impact on a company's investment and cash holdings, which can then affect the demand for loans, altering the credit supply of commercial banks and impacting the actual economy. This study aims to evaluate the efficiency of macroeconomic policies issued by the government and microeconomic policies adopted by banks to alleviate economic volatility and achieve economic governance, adding to the existing literature by investigating the relationship between economic policy uncertainty and bank lending decisions.

The findings of this study are significant for a range of stakeholders, including the bank regulatory body which is National Bank of Ethiopia in Ethiopian context, investors, bank managers, domestic business owners, and the general public. The study provides valuable information and insights into the potential link between economic policy uncertainties, credit risk, and lending decisions, filling the information gap that exists in the country regarding this area of study. Additionally, the study adds to the growing literature on the relationship between economic policy uncertainty and bank lending decisions, providing implications for regulators, policymakers, managers, and investors when making decisions in a world of increasing economic and political uncertainty. Finally, the study is useful for other researchers who intend to conduct a study on the same or related areas.

1.7 Scope and Limitations of the Study

The overarching aim of the research work is to investigate the effects of economic policy uncertainty on banks' credit risks (non-performing loans) and lending decisions in Ethiopian commercial banks. To achieve this objective, the study included 10 commercial banks operating in the country, with data collected annually for the fiscal years 2010-2021. However, the study has some limitations.

The first and most significant challenge in this study is the limited empirical literature on the investigation in Ethiopia context. Another limitation arises from the study's reliance on a limited series of data for the period from 2010-2021, with recent data beyond the ending periods and previous data before 2010 inaccessible due to the unavailability of complete and consistent data for some of the variables of interest addressed in this study. Consequently, the study had to combine multiple sources of data and use a one-year time span to ensure consistency.

1.8 Organization of the Study

The rest of the thesis is organized into four chapters.

Chapter Two provides a theoretical review, an empirical review of previous studies, and a conceptual framework for the study. This chapter critically examines the existing literature on economic policy uncertainty, credit risk, and lending decisions.

Chapter Three outlines the model specification, data types and sources, and estimation techniques used in the study. This chapter describes the econometric models employed to analyze the relationship between economic policy uncertainty, credit risk, and lending decisions in Ethiopian commercial banks.

Chapter Four presents the data analysis and interpretation of the outputs. This chapter provides a detailed analysis of the empirical results obtained from the econometric models, including descriptive statistics and regression analysis.

Chapter Five summarizes the findings, draws conclusions, provides policy recommendations, and suggests further research directions. This chapter draws upon the evidence presented in the preceding chapters to evaluate the effect of economic policy uncertainty on credit risk and lending decisions in Ethiopian commercial banks. It also provides recommendations for policymakers, bank managers, and investors, and suggests areas for future research.

CHAPTER TWO: REVIEW OF RELATED LITERATURE

2.1. Review of Theoretical Literature

2.1.1 Definition and Concepts of Economic Policy

Economic policy refers to the set of actions and decisions intended to influence or control the behavior of an economy, with the ultimate goal of achieving economic growth, full employment, and price stability. This includes a range of measures that governments use to manage their economies, such as monetary policy, taxation, government spending, and income redistribution.

Fiscal policy is a crucial instrument of macroeconomic policy that operates through budgetary operations. It involves the manipulation of government receipts and expenditures to stabilize the economy, allocate resources, redistribute income, achieve social objectives, and maintain stable economic growth. The core components of the budget are public revenue and public expenditure, and fiscal policy is a primary tool that governments can use to mobilize domestic resources and allocate them to pursue socioeconomic development objectives (Bird, 2014).

Monetary policy, on the other hand, involves controlling the amount and cost of money in an economy. It is another crucial element of economic policy, as a lack of money may hinder economic growth by preventing the necessary liquidity for transactions, while an abundance of money may lead to inflation, which can also negatively impact the process of economic growth. Therefore, appropriate policy settings must be practiced by the government or the nation's central bank, which controls the currency.

In summary, economic policy covers a range of measures that governments use to manage their economies, including fiscal and monetary policies, in order to achieve economic growth, full employment, and price stability.

2.1.2 Concepts and Definitions of Economic Policy Uncertainty

Economic policy uncertainty arises from uncertainty regarding government policies, including monetary, fiscal, and regulatory policies, and the unknown effects of new policies on the economy and the private sector. Uncertainty regarding inflation, weak economic growth, financial crises, lending restrictions, pandemics, rising unemployment rates, foreign exchange volatility, and unforeseen changes to the monetary policy rate are some of the causes of economic policy uncertainty.

Policy shocks, such as sudden changes in monetary and fiscal policies, changes in tax and regulatory reforms, and frequent policy changes introduced by governments, can trigger economic policy uncertainty. Additionally, the potential for governments to take positions opposing policies in enforcement, new policies enforced by private sector profits, unethical public policy and practices, lack of continuity of government policy programs, cultural factors, lack of planning, lack of political will, and corruption can also increase economic policy uncertainty.

The increase in economic policy uncertainty can have significant impacts on the business decisions of enterprises. Studies indicate that it can lead to a reduction in investment levels (Julio and Yook, 2012; Gulen and Ion, 2015), a decrease in corporate debt ratings, an increase in the cost of corporate debt, and a reduction in dividend payments. High policy uncertainty can cause businesses to delay investing, which ultimately lowers private sector production (Wang et al., 2014; Kang et al., 2014). Banks are also impacted by economic policy uncertainty, as it encourages bank management to revalue their loan portfolio and raises loan interest rates.

Bernanke (1983) conducted research on the impact of uncertainty on firms' investment decisions and found that high levels of uncertainty often cause firms to delay investment and reduce hiring, especially when investment projects are difficult to reverse or workers are expensive to hire and fire. As uncertainty diminishes, firms tend to increase their investment and hiring to cater to rising demand. In his study, Bernanke also analyzed the optimal timing of investment decisions, assuming that investment is irreversible and new information about returns becomes available gradually over time. He concluded that uncertainty reduces the current level of investment, and that firms should only invest when the costs of delaying the project are outweighed by the expected benefits of waiting for additional information.

The uncertainties surrounding potential changes in government leadership or policy can affect the behavior of businesses through various avenues, including industry regulation, monetary and trade policy, and taxation. Research indicates that non-financial companies tend to reduce their investment spending in response to policy uncertainties related to elections (Jens, 2017). Bond and Van Reenen (2007) argued that if an investment is at least partially irreversible, firms should

exercise caution and reduce their investment in the face of uncertainty. This is because the costs of reversing an investment may be high, and the anticipated benefits of waiting for additional information may outweigh the costs of delaying the investment. Therefore, businesses must carefully evaluate the potential impact of policy uncertainties on their investment decisions and consider the risks and benefits of delaying investment in the face of uncertainty.

Kara and Yook (2019) noted that it is not entirely clear how policy uncertainty will affect the lending behavior of banks. While many bank loans are at least partially irreversible, the question remains whether banks would reduce credit supply in response to policy uncertainty. This is an important question because financial institutions, which operate in a highly regulated industry, are likely to face more uncertainty than firms when the political landscape changes. Furthermore, the reaction of these institutions to policy uncertainty may have a significant economic ripple effect due to their role as intermediaries. Therefore, it is essential to carefully examine the potential impact of policy uncertainty on the lending behavior of banks and to develop strategies to mitigate any adverse effects.

2.1.3 Definition and Concept of Credit Risk for Banks

Giesecke (2004) observed that banks have two core functions: one of it is collecting deposits and the other one is funding credit facilities while banks play a critical role in providing credit facilities to borrowers, excessive lending can expose them to default risk, which can threaten their financial stability. To mitigate this risk, banks employ various risk management techniques, including credit analysis, diversification, and setting aside reserves to cover potential losses.

Credit risk can arise when a borrower fails to repay a loan or meet their financial obligations. Various factors can contribute to credit risk, according to Mishkin (2015) some of them are: Economic downturns, such as recessions or depressions, can increase credit risk as borrowers may struggle to pay off their debts due to unemployment or reduced income. Certain industries may also be more vulnerable to credit risk than others due to industry-specific risks. Default risk is another factor that can contribute to credit risk, which refers to the likelihood of a borrower failing to make payments on their debt, influenced by the borrower's credit history, financial stability, and ability to repay the debt. Interest rate risk is another factor that can increase credit risk as changes in interest rates can impact the borrower's ability to repay their debt. Collateral risk can also contribute to credit risk, which refers to the possibility that the collateral used to

secure the loan may lose value over time. Finally, legal and regulatory changes can increase credit risk by affecting the borrower's ability to repay their debt, such as changes in bankruptcy laws.

Increasing non-performing loans (NPLs) in the banking sector are viewed as a signal of financial instability (Kaminsky and Reinhart, 1999). Poor-quality loans were one of the root causes of the global financial crisis in 2008, underscoring the importance of analyzing macroeconomic determinants of loan performance and their impact on the financial system, not only for banks but also for the entire economy. Effective management of NPLs is critical for reducing the financial risk they pose, which can destroy economic activity and trap resources in inefficient practices (Karica, 2014). NPLs are a key indicator of instability in the financial system and economy, and understanding the factors that contribute to them is crucial for identifying financial stability risks. Controlling NPLs is essential for the performance of individual banks and the overall financial environment of the economy (McNulty et al., 2001). High levels of NPLs can have a negative impact on global macroeconomic stability (Makri et al., 2014).

Bank size, as measured by total deposits or assets, is often used as a control variable when analyzing bank performance. This is done to account for the possibility that larger banks may have greater product and loan diversification, as well as economies of scale (Civelic and Al-Alami, 1991; Smirlock, 1985). The impact of bank size on profitability is uncertain, as larger banks may be able to negotiate better prices and administer prices more effectively, resulting in higher profits (Agu, 1992). However, larger banks may also face challenges related to complexity and bureaucracy, which could negatively impact profitability.

Engdawork (2014) suggests that failed banks are typically characterized by a rise in the proportion of nonperforming loans, rather than low operating efficiency. As a bank's credit risk increases, liquidity and solvency issues may gradually emerge. To minimize credit risk, it is essential for banks to understand the borrowers to whom they extend credit. This includes conducting thorough due diligence and assessing the borrower's creditworthiness to ensure that the bank's exposure is within an acceptable limit.

Even though there are challenges that threaten the Ethiopian economy, the banking sector has experienced positive growth in recent years.

Table 2.1 Summarizing the performance of Ethiopian banks from 2010 to 2021, using various measurements

Year	Total Deposits (ETB billions)	Total Loans (ETB billions)	Net Profit (ETB billions)	Return on Assets (%)	Non-Performing Loan Ratio (%)	Capital Adequacy Ratio (%)
2010	94.1	62.2	3.6	2.3	2.3	16.2
2011	152.1	105.7	4.6	2.7	5.3	16.2
2012	178.5	122.6	5.6	2.5	4.4	17.7
2013	211.9	142.6	6.1	2.5	3.6	17.9
2014	246.4	164.8	7.3	2.4	3.2	17.5
2015	283.1	189.4	14.5	2.2	3.0	16.5
2016	328.5	220.4	16.2	2.0	2.5	15.5
2017	372.8	253.7	14.6	1.8	2.3	15.3
2018	430.9	292.7	11.0	1.5	2.0	15.8
2019	497.3	337.2	8.2	1.4	1.7	15.1
2020	575.0	390.4	4.8	0.9	1.7	14.6
2021	657.8	449.3	2.3	0.5	2.0	16.0

Source: Own computation from NBE report

The table shows that the total deposits and loans of Ethiopian banks have been increasing steadily over the past 11 years, with total deposits growing from 94.1 billion ETB in 2010 to 657.8 billion ETB in 2021, and total loans growing from 62.2 billion ETB in 2010 to 449.3 billion ETB in 2021. However, the net profit of Ethiopian banks has been volatile over the same period, with a high of 16.2 billion ETB in 2016 and a low of 2.3 billion ETB in 2021. Return on assets has been declining since 2010, from 2.3% to 0.5% in 2021. The non-performing loan ratio

has been volatile, with a high of 5.3% in 2011 and a low of 1.7% in 2019 and 2020. The capital adequacy ratio has fluctuated over the years, but has generally remained above the minimum regulatory requirement of 15%, except in 2020 when it fell to 14.6%.

Overall, the table suggests that while Ethiopian banks have been successful in growing their deposit and loan portfolios, profitability and asset quality have been a challenge. Lower net profit and return on assets may indicate increased competition and/or rising operating costs. Banks may need to focus on improving operational efficiency and developing new revenue streams to maintain sustainable profitability. The volatile non-performing loan ratio may require increased attention to credit risk management and loan recovery efforts. The increase in capital adequacy ratio in recent years may provide some buffer against potential risks and shocks to the banking system.

2.1.4 Definitions and Concepts of Bank Lending Decisions

The loan and advance portfolio is a significant source of revenue for commercial banks, as reflected on their balance sheets. This asset is created by making a lending decision based on loan applications from clients. However, before making a decision on a customer's loan request, banks take into account internal and external factors depending on the type, the amount, the intended use, in addition other crucial factors that impact a borrower's ability to secure a loan include their credibility, the extent of their own capital investment, the collateral they can offer, and their credit history from previous loans (Nelson & Victor, 2009).

While a bank's total asset package may include various components such as cash, deposits with other banks including reserves at the central bank, loans, investments, fixed assets, etc., there is a general consensus that the quality of the loan portfolio is of utmost importance. This is due to the large size of loans on a bank's balance sheet, which stems from their primary role as financial intermediaries. Additionally, bank loans are often the primary asset that generates the majority of a bank's income. Therefore, the quality of the loan portfolio has a significant impact on a bank's profitability (Tesfaye, 2014; adapted).

According to Ciccarelli et al. (2015), the primary channels through which economic policy uncertainty affects the banking sector are the supply of bank credit and loan pricing. Uncertainty in economic policy can lead to banks adjusting their interest rates and reducing the quantity of loans they make to borrowers. As a result, the amount of credit available to borrowers may

decrease when economic policy is highly uncertain. This phenomenon has been observed in studies such as Bordo et al. (2016), which highlight the impact of economic policy uncertainty on banks' lending portfolios.

Berger (1995), commercial banks hold more equity to avoid distress periods when bankruptcy costs suddenly rise. Both the signaling and bankruptcy cost hypotheses suggest that there is a positive relationship between capital and the assets owned by commercial banks (Ommeren, 2011; Tomola, 2013). Deposit mobilization significantly influences lending behavior, as commercial banks focus on increasing deposits to improve lending activities (Olokoyo, 2011). The risk-return hypothesis suggests that higher expected returns come with increasing risks through leverage. Therefore, if commercial banks expect higher returns, they may increase leverage and the amount of loans to the public, which can decrease the bank's capital. Based on this theory, a negative relationship is predicted between capital and return on equity (Ommeren, 2011; Sharma and Gounder, 2012; Tomola, 2013).

There is indeed a consensus in the literature that economic growth can have a positive impact on bank performance. Athanasoglou et al. (2005) found that GDP growth is positively associated with bank profitability in the European Union, with credit demand being higher during economic booms compared to recessions. Bourke (1989) argued that economic growth can increase banks' profits, especially in markets with high entry barriers.

According to previous literature, inflation can be a significant determinant of banking performance. High inflation rates are generally associated with high loan interest rates, which can lead to higher income for banks. However, the impact of inflation on banking performance may depend on whether inflation is anticipated or unanticipated, as Perry (1992) notes. In relation to Greece, Athanasoglou et al. (2005) found that the relationship between inflation levels and bank profitability is debatable and the direction of the relationship is not clear. This point is also made by Vong and Chan (2009).

2.2 Empirical Literature

2.2.1 Economic Policy Uncertainty and Firms

Yung and Root (2019) conducted a study on the impact of economic policy uncertainty on financial and investment decisions of firms. They found evidence that economic policy uncertainty is positively associated with management earnings, implying that firms may increase or decrease management earnings depending on the level of economic policy uncertainty.

Emir and Ersan (2017) investigated the impact of economic policy uncertainty on firms' cash holdings in BRICS countries. Using firm-level data from 2006 to 2015, they found that firms tend to hold more cash when economic policy uncertainty increases. They also found that economic policy uncertainty has a significant positive impact on corporate cash holdings.

According to Xu (2020), uncertainty in government economic policy can raise the cost of financing for businesses, which can lead to fewer innovative activities. Companies that are more exposed to uncertain government economic policy may have higher weighted average capital costs and may scale down their investment. In addition, Jory et al. (2020) found that during times of high economic policy uncertainty, firms tend to reduce their receivables periods and face shorter payables periods from suppliers. However, the tightening of trade credit during these periods can increase shareholder value only up to a certain point, beyond which it can lead to losing customers to competitors.

Yohannes and Tadesse (2021) investigate the relationship between economic policy uncertainty and firm-level investment in Ethiopia, using data from a survey of 500 firms. The authors find that policy uncertainty negatively affects investment, and that this effect is stronger for smaller and younger firms. Again Henok and Moti (2021) investigated the effect of political and economic policy uncertainty on investment: evidence from Ethiopia, using quarterly data from 2005 to 2019. The authors find that policy uncertainty has a negative and significant effect on investment, particularly in the manufacturing sector.

The study on impact of policy uncertainty on macroeconomic outcomes in Ethiopia by Abel and Arega (2019), using quarterly data from 2010 to 2018. The authors find that policy uncertainty has a negative effect on economic growth, investment, and inflation. Similarly Daniel and Girmay (2018) examine the effect of economic policy uncertainty on private investment in Ethiopia, using annual data from 1990 to 2014. The authors find that policy uncertainty has a

negative effect on private investment, and that this effect is stronger for foreign investors compared to domestic investors.

Getahun and Alemayehu (2017) analyze the effect of economic policy uncertainty on household consumption in Ethiopia, using data from a household survey. The authors find that policy uncertainty has a significant negative effect on household consumption, particularly for non-food items.

These studies suggest that economic policy uncertainty is a significant challenge for the economy by affecting investment, growth, inflation, and household consumption. Policymakers may need to focus on improving policy transparency, predictability, and consistency to mitigate the negative effects of uncertainty on the economy.

2.2.2 Economic Policy Uncertainty and Bank Credit Risks

Chi and Li (2017) conducted a study on the impact of economic policy uncertainty on banks' credit risks and lending decisions in China. They used data from Chinese commercial banks between 2000 and 2014 and found that policy uncertainty has a significantly positive relationship with non-performing loan ratios, loan concentrations, and the normal loan migration rate. Their findings suggest that policy uncertainty increases credit risks for banks and has a negative impact on loan size, especially for joint-equity banks. They recommended that banks can improve their operational performance by reducing loan sizes in response to the rising credit risks caused by policy uncertainty.

Rajan and Dhal (2003) conducted a study on Indian banks, using regression analysis to analyze the impact of macroeconomic and bank-specific factors on non-performing loan rates. The authors found that GDP growth rate, maturity, bank size, credit orientation, and credit terms are significant factors affecting non-performing loan rates. The authors also highlighted the government's belief that the profitability and sustainability of privately owned commercial banks depend on a safe business floor created by regulations and the fact that most commercial bank failures are caused by non-performing loans.

A study by Zhang et al. (2019) found a positive relationship between loan interest rates and NPLs in the Chinese banking sector. They argued that higher interest rates can increase the burden of debt repayment for borrowers, leading to an increase in NPLs. A study by Fosu and Ndebugri (2018) found that inflation has a positive effect on NPLs in the Ghanaian banking

sector. They argued that inflation can erode the value of collateral held by banks and reduce the ability of borrowers to repay their loans.

Several studies have found that GDP growth is negatively associated with NPLs. For example, a study by Ahn and Lee (2018) found that GDP growth has a negative relationship with NPLs in the Korean banking sector. They argued that higher economic growth can lead to higher employment and income levels, reducing the likelihood of borrower defaults.

A study by Afolabi et al. (2018) found that bank size has a negative effect on NPLs in the Nigerian banking sector. They argued that larger banks are better able to diversify their loan portfolios, reducing the impact of individual loan defaults on their overall portfolio. A study by Lin et al. (2018) found that capital adequacy ratios have a negative relationship with NPLs in the Taiwanese banking sector. They argued that higher capital adequacy ratios can provide a buffer against loan losses and reduce the likelihood of bank failures.

Afolabi et al. (2018) conducted a study on the impact of bank size on non-performing loans (NPLs) in the Nigerian banking sector, finding that bank size has a negative effect on NPLs. They argued that larger banks are better able to diversify their loan portfolios, reducing the impact of individual loan defaults on their overall portfolio.

A study by Sadiq and Asif (2017) on the banking sector in Pakistan found that a higher loan to deposit ratio was positively associated with NPLs. The study analyzed data from 1990 to 2015 and found that a 1% increase in LDR led to a 0.18% increase in NPLs. Similarly, a study by Sohrab and Saifur (2018) on the banking sector in Bangladesh found that a higher LDR was positively associated with NPLs. The study analyzed data from 2008 to 2017 and found that a 1% increase in LDR led to a 0.15% increase in NPLs.

Lin et al. (2018) investigated the relationship between capital adequacy ratios and NPLs in the Taiwanese banking sector, finding a negative relationship between the two. They argued that higher capital adequacy ratios can provide a buffer against loan losses and reduce the likelihood of bank failures.

Louzis et al. (2012) argued that well-diversified loan portfolios can lead to lower credit risk and lower NPLs. Several researchers, including Salas and Saurina (2002), Louzis et al. (2012), Amuakwa-Mensah and Boakye-Adjei (2015), and Ha and Hang (2016), have found a negative relationship between NPLs and bank size, which is often used as a proxy for loan portfolio diversification.

Table 2.2 Empirical findings on the effect of economic policy uncertainty on bank credit risk

Study	**Methodology**	**Key Findings**
Adetula et al. (2020)	Panel data analysis	Economic policy uncertainty has a positive effect on non-performing loans in Nigerian banks, and the effect is more pronounced for banks with higher levels of liquidity.
Azmi et al. (2020)	Regression analysis	Economic policy uncertainty has a positive effect on non-performing loans in Malaysian banks, and the effect is more pronounced for smaller banks.
Bouri et al. (2020)	Panel data analysis	Economic policy uncertainty has a positive effect on non-performing loans in European banks, and the effect is more pronounced during times of high uncertainty and for banks with weaker balance sheets.
Gholipour Fereidouni et al. (2020)	Regression analysis	Economic policy uncertainty has a positive effect on non-performing loans in Iranian banks, and the effect is more pronounced for banks with higher levels of liquidity and lower levels of capital adequacy.
Kassim et al. (2019)	Panel data analysis	Economic policy uncertainty has a positive effect on non-performing loans in Malaysian Islamic banks, and the effect is more pronounced for banks with weaker financial positions.
Kassim et	Panel data analysis	Economic policy uncertainty has a positive effect on non-

Study	Methodology	Key Findings
al. (2020)		performing loans in Malaysian commercial banks, and the effect is more pronounced for banks with weaker financial positions.
Khediri et al. (2019)	Regression analysis	Economic policy uncertainty has a positive effect on non-performing loans in Tunisian banks, and the effect is more pronounced during times of high uncertainty and for banks with weaker balance sheets.
Liu et al. (2020)	Regression analysis	Economic policy uncertainty has a positive effect on non-performing loans in Chinese banks, and the effect is more pronounced for banks with weaker financial positions and higher levels of liquidity.
Wang et al. (2019)	Regression analysis	Economic policy uncertainty has a positive effect on non-performing loans in Chinese banks, and the effect is more pronounced for smaller banks and banks with lower levels of capital adequacy.

Source: own computation from reviewed related empirical literature

2.2.3 Economic Policy Uncertainty and Bank's Lending Decisions

The uncertain economic policy can create a noisy signal of expected income on bank balance sheets, making it difficult for banks to predict the economic prospects of businesses and reducing loan scales. Baum et al. (2010) used industrial product volatility as a proxy for economic uncertainty and found that as uncertainty increased, banks became more risk-averse. Bordo et al. (2016) also found that economic policy uncertainty has a significant negative impact on bank credit growth.

Demir and Danisman (2021) conducted a study on the effects of economic policy uncertainty and geopolitical risks on bank credit growth, analyzing 2,439 banks from 19 countries between 2010 and 2019. The authors found that economic policy uncertainty leads to a significant decrease in banking credit growth

Bordo et al. (2016) analyzed the impact of economic policy uncertainty on aggregate bank credit growth, including data from several decades, including the Great Recession. They found that policy uncertainty has a significant negative effect on bank credit growth, and their results suggest that high policy uncertainty from the Great Recession restrained overall credit growth through the bank lending channel. Ndou and Mokoena (2019) also found that positive economic policy uncertainty shocks lead to an increase in bank lending rate margins, while negative shocks lead to a decrease.

Hu and Gong (2019) conducted a study on the impact of economic policy uncertainty on bank lending expansion, finding that policy uncertainty significantly slows down loan growth. They also found that policy uncertainty has a higher negative impact on larger, riskier banks than on liquid, diversified institutions.

Nguyen et al. (2020) conducted a study on the influences of economic policy uncertainty on aggregate bank credit growth at domestic and global levels, finding that a higher level of economic policy uncertainty has a negative impact on bank credit growth. They also found that a positive change in economic policy uncertainty has favorable effects on bank credit growth.

Baker et al. (2013) conducted a study on the impact of policy uncertainty on output, employment, and investment, finding that an increase in policy uncertainty is associated with a decline in these variables. They also argued that policy uncertainty may ultimately affect bank credit by influencing corporate behavior, as firms may increase their cash holdings and reduce their demand for bank credit, leading to a reduction in credit scale.

Guo and Stepanyan (2017) conducted a study on the relationship between interest rates and bank lending in the United States, finding that higher interest rates have a negative relationship with bank lending. They argued that higher interest rates can increase borrowing costs, reducing the demand for credit.

Gan and Hu (2018) conducted a study on the impact of inflation on bank credit growth in China, finding that inflation has a negative effect on credit growth. They argued that higher inflation can increase uncertainty and reduce the demand for credit.

Sufian and Chong (2017) conducted a study on the relationship between GDP growth and bank lending in Malaysia, finding that GDP growth has a positive relationship with bank lending. They argued that higher economic growth leads to an increase in demand for credit from businesses and individuals.

Berger and Bouwman (2017) conducted a study on the impact of bank size on bank credit growth in the United States, finding that larger banks have a positive effect on credit growth. They argued that larger banks have greater access to funding and are able to exploit economies of scale, enabling them to extend more credit.

Unemployment can have a significant impact on lending decisions and non-performing loans (NPLs) in the banking sector. When unemployment rates are high, borrowers may be less likely to repay their loans, which can lead to an increase in NPLs. This, in turn, can affect the lending decisions of banks, as they may become more cautious in providing loans to borrowers with a higher risk of default. A study by Ongore and Kusa (2013) on the banking sector in Kenya found that unemployment had a significant positive effect on NPLs. The study also found that banks responded to higher NPLs by reducing their lending activities. Similarly, a study by Duygun et al. (2014) on the banking sector in Turkey found that higher unemployment rates were associated with higher NPLs. The study also found that banks responded to higher NPLs by reducing their lending activities, particularly to riskier borrowers.

Cao et al. (2018) conducted a study on the relationship between capital adequacy ratios and bank credit growth in China, finding that higher capital adequacy ratios have a positive effect on credit growth. The authors argued that higher capital adequacy ratios can increase investor confidence and reduce the cost of funding, enabling banks to extend more credit.

Table 2.3 Empirical findings on the effect of economic policy uncertainty on lending decision of banks

Study	**Methodology**	**Key Findings**
Akhtaruzzaman et al. (2018)	Panel data analysis	Economic policy uncertainty has a negative impact on bank lending in Bangladesh, and the effect is more pronounced for smaller banks.
Baker et al. (2016)	Regression analysis	Economic policy uncertainty reduces bank lending in the United States, and the effect is more pronounced for banks that rely more on deposits for funding.
Brown et al. (2017)	Regression analysis	Economic policy uncertainty reduces bank lending in the United Kingdom, and the effect is more pronounced during periods of high uncertainty.
Caggiano et al. (2019)	Vector autoregression	Economic policy uncertainty has a negative impact on bank lending in Italy, and the effect is more pronounced during periods of high uncertainty and for banks with weaker balance sheets.
Chiu et al. (2019)	Regression analysis	Economic policy uncertainty reduces bank lending in Taiwan, and the effect is more pronounced for banks with higher levels of capital and liquidity.
Eichner and Littke (2018)	Regression analysis	Economic policy uncertainty reduces bank lending in Germany, and the effect is more pronounced for small and medium-sized banks.
Kashif et al.(2019)	Panel data analysis	Economic policy uncertainty reduces bank lending in Pakistan, and the effect is more pronounced for smaller banks.

Study	Methodology	Key Findings
Kishor and Sharma (2017)	Regression analysis	Economic policy uncertainty reduces bank lending in India, and the effect is more pronounced for state-owned banks.
Liu et al. (2019)	Regression analysis	Economic policy uncertainty has a negative impact on bank lending in China, and the effect is more pronounced for banks with lower levels of capital and liquidity.
Ozili and Arun (2020)	Panel data analysis	Economic policy uncertainty has a negative impact on bank lending in Nigeria, and the effect is more pronounced for smaller banks.
Smales and Tian (2018)	Regression analysis	Economic policy uncertainty reduces bank lending in Australia, and the effect is more pronounced for banks with lower levels of capital and liquidity.
Wang et al. (2019)	Regression analysis	Economic policy uncertainty reduces bank lending in China, and the effect is more pronounced for banks with higher levels of liquidity.

Source: own computation from reviewed related empirical literature

These studies suggest that economic policy uncertainty has a negative impact on bank lending, and the effect is more pronounced during periods of high uncertainty, for smaller banks, and for banks with weaker balance sheets or lower levels of capital and liquidity. The studies also highlight the importance of understanding the mechanisms through which economic policy uncertainty affects banks' lending decisions and credit risks, as well as the potential spillover effects on the broader economy.

2.2.4 Related Empirical Studies in Ethiopia

Sisay and Mekonnen (2015) conducted a study on the determinants of non-performing loans in the Ethiopian banking sector, using panel data from 15 commercial banks over the period 2005-2013. They found that GDP growth has a negative effect on non-performing loans, while lending rate and bank size have a positive effect.

Similarly, Alemayehu (2020) conducted a study on the determinants of non-performing loans in Ethiopian commercial banks, using data from 15 banks over the period 2010-2019. The author found that GDP growth has a negative effect on non-performing loans, while lending rate and bank size have a positive effect.

Tadesse and Zewdun (2015) also conducted a study on the determinants of non-performing loans in Ethiopian commercial banks, using panel data from 16 commercial banks over the period 2005-2013. They found that GDP growth has a negative effect on non-performing loans, while lending rate and bank size have a positive effect. They also found that credit risk management practices and loan recovery efforts are important determinants of non-performing loans.

Anisa (2015) conducted a study on the determinants of nonperforming loans in eight Ethiopian commercial banks over a period of ten years. The study found that deposit rate, loan-to-deposit ratio, and lending interest rate had a positive and significant impact on nonperforming loans. The study also found that cost efficiency had a negative and significant impact on nonperforming loans. However, bank solvency ratio, gross national product (GNP) growth rate, and inflation rate had a negative and statistically insignificant impact on nonperforming loans.

The study suggested that bank loan officers should monitor each borrower's circumstances constantly to detect loan problems before they become uncorrectable. The study also emphasized the importance of effective credit risk management practices to minimize nonperforming loans in the Ethiopian banking industry.

Amano (2014) conducted a study on the factors that influence commercial banks' lending practices in Ethiopia, using balanced fixed effect panel data from eight commercial banks over the period from 2001 to 2013. The study found that while the liquidity ratio and interest rate had a negative and significant influence on loans and advances, the deposit volume, bank size, cash reserve requirement, and inflation rate had a positive and substantial impact on loans and

advances. However, the real GDP growth rate had a statistically negligible effect on banks' loans and advances.

Table 2.4 Empirical findings related to the study in Ethiopian context:

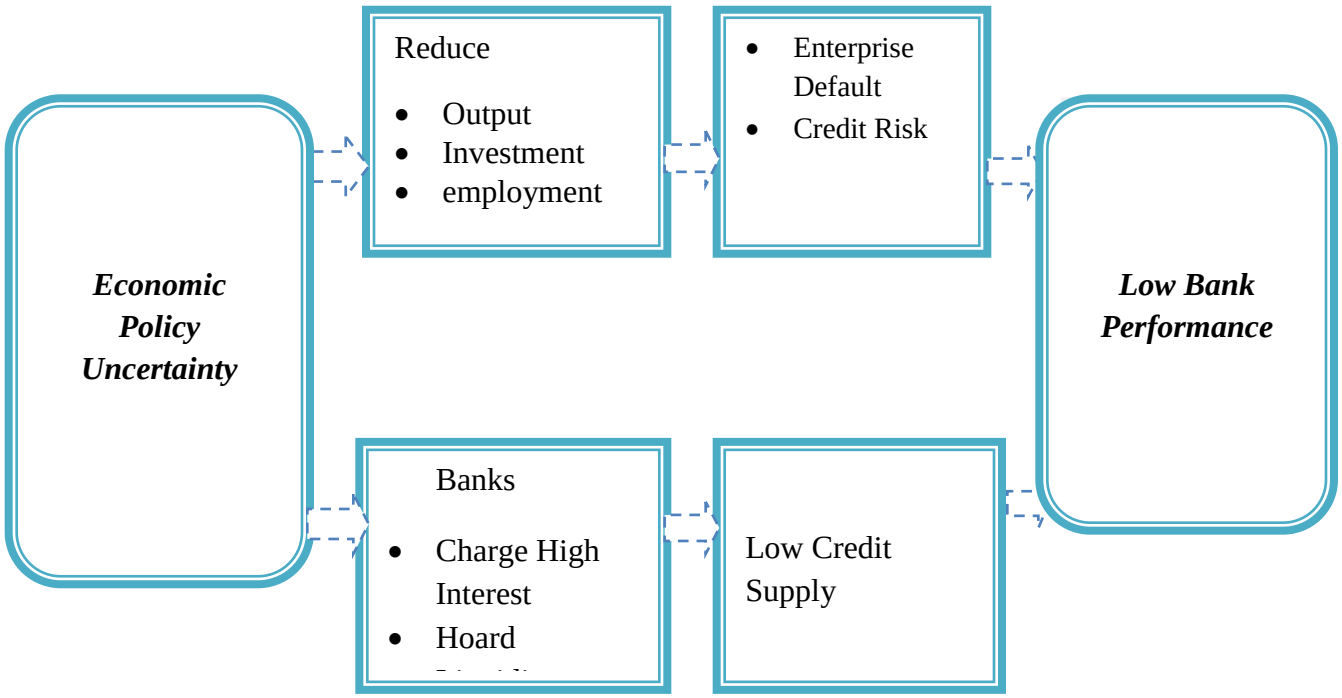
Study	**Methodology**	**Key Findings**
Abera et al. (2016)	Panel data analysis	Loan growth in Ethiopian commercial banks is positively influenced by capital adequacy, profitability, and credit risk management, while it is negatively impacted by bank size and liquidity. Non-performing loans are positively associated with loan growth, loan concentration, and credit risk management.
Alemu and Gedamu (2018)	Descriptive analysis	Non-performing loans in Ethiopian commercial banks are associated with weak credit risk management, poor loan recovery practices, inadequate collateral valuation, and lax loan approval processes.
Asfaw and Abebe (2018)	Regression analysis	Loan growth in Ethiopian commercial banks is positively influenced by capital adequacy, profitability, liquidity, and credit risk management, while it is negatively impacted by bank size. Non-performing loans are positively associated with loan loss provisions, loan concentration, and credit risk management.
Assefa and Molla (2019)	Descriptive analysis	Non-performing loans in Ethiopian commercial banks are associated with weak credit risk management, poor loan appraisal and monitoring practices, and inadequate collateral valuation.
Ayalew (2017)	Descriptive analysis	Non-performing loans in Ethiopian commercial banks are associated with weak governance and risk management practices, poor loan appraisal and monitoring, and inadequate

		collateral valuation.
Belete and Tadesse (2019)	Regression analysis	Loan growth in Ethiopian commercial banks is positively influenced by capital adequacy, profitability, and liquidity, while it is negatively impacted by loan concentration. Non-performing loans are positively associated with loan concentration, loan loss provisions, and credit risk management.
Dagne and Tilahun (2018)	Descriptive analysis	Non-performing loans in Ethiopian commercial banks are associated with weak credit risk management, poor loan appraisal and monitoring practices, and inadequate collateral valuation.
Fufa (2019)	Descriptive analysis	Non-performing loans in Ethiopian commercial banks are associated with weak credit risk management, inadequate collateral valuation, and poor loan recovery practices.
Mulugeta and Tadesse (2018)	Regression analysis	Loan growth in Ethiopian commercial banks is positively influenced by capital adequacy, profitability, and liquidity, while it is negatively impacted by loan concentration and bank size. Non-performing loans are positively associated with loan concentration, loan loss provisions, and credit risk management.
Wubie (2018)	Descriptive analysis	Non-performing loans in Ethiopian commercial banks are associated with weak credit risk management, poor loan appraisal and monitoring practices, inadequate collateral valuation, and poor loan recovery practices.

Source: own computation from reviewed related empirical literature

2.3 Conceptual Framework of the Study

Overall, the literature highlights the importance of understanding the implications of economic policy uncertainty on banks' lending decisions and credit risks, as it can have significant consequences for the stability and growth of the banking sector and the broader economy. Therefore based on the theoretical and empirical literature on the interaction between economic policy uncertainty, credit risks, and banks' lending decisions, we developed the under stated conceptual framework for this study as shown in figure (2.1) below.



Source: Own development from the literature review above

Fig. 2.1 Conceptual Framework of the Research

CHAPTER THREE: METHODOLOGY AND MODEL SPECIFICATION

3. Introduction

The purpose of this section is to introduce the hypothesis and rationale for the research, and to provide an overview of the research approach and empirical techniques used. Furthermore, this chapter will clarify the scope of the research design and position it within the context of existing research.

3.1 Research Design

This study aims to analyze and examine the impact of economic policy uncertainty on credit risk, specifically the non-performing loan ratio, and on bank lending decisions, measured by growth rate of loans. An explanatory research design was employed to demonstrate the extent and nature of policy uncertainty's effects on these critical areas of bank credit.

3.2 Data Source and Description of Variables

This research utilizes annual panel data spanning from 2010 to 2021 (T = 12) for 10 commercial banks in Ethiopia. The selection of banks and the time span were based on the banks' historical formation time, ownership structure, asset size, and the availability and consistency of data. The study includes only two forms of bank ownership: those fully owned by the government and those fully owned by the private sector, as foreign involvement in the financial sector is prohibited. The selected banks have been in the industry for over a decade, have large market shares and asset sizes, and are appropriate for generalizing the final results. The study includes one long-standing government-owned bank and nine private banks, namely the Commercial Bank of Ethiopia, Awash Bank, Dashen Bank, Bank of Abyssinia, Hibret Bank, Wegagen Bank, Lion International Bank, Nib International Bank, Oromia Bank, and Cooperative Bank of Oromia.

To ensure the consistency of panel data throughout the study period, small-sized banks operating for less than a decade in the industry and the Development Bank of Ethiopia (DBE) were excluded. The DBE was established for development purposes and operates differently from commercial banks.

Data for this study were collected from various sources. Bank-specific variables used in the study were obtained from the annual reports and audited financial statements of the selected commercial banks, as well as their respective websites. The national bank of Ethiopia also provided some of the data. Along with bank-specific and policy uncertainty indicators, this research incorporates macroeconomic variables to distinguish the impact of economic cycles from uncertainty. Gross Domestic Product (GDP), a proxy for economic growth, is obtained from the World Bank's open source of world development indicators. Additionally, inflation rate, unemployment rate and inflation rate are obtained from the national bank report.

The variable of interest, economic policy uncertainty, was obtained from policyuncertainty.com, developed by Ahir et al. (2018). Ahir et al. (2018) developed a global uncertainty index covering 143 countries, with quarterly data available since 1996-Q1. Their approach involves a textual analysis of quarterly country reports from the Economist Intelligence Unit (EIU), and is similar to Baker et al.'s (2016) economic policy uncertainty index. The global uncertainty index employs a five-step process developed by experienced analysts within each country, using the EIU reports to capture economic, political, and financial trends. Researchers such as Ashraf (2021) have found that the global uncertainty index is more effective in measuring local economic uncertainty compared to other Economic Policy Uncertainty (EPU) indexes.

Table 3.1 List of selected Ethiopian commercial banks including their ownership structure, year of foundation and official websites

Banks	**Ownership structure**	**Year of foundation in European calendar**	**Official Website**
Nib International Bank (NIB)	Private	1999	https://www.nibbanksc.com/
Awash Bank (AB)	Private	1994	http://www.awashbank.com/
Bank of Abyssinia (BA)	Private	1996	http://www.bankofabyssinia.com/
Commercial Bank of Ethiopia (CBE)	State	1963	https://web.archive.org/web/20180822065616/http://www.combanketh.et/

Cooperative Bank of Oromia (COOP.)	Private	2005	http://www.coopbankoromia.com.et/
Dashen Bank (DB)	Private	1995	http://www.dashenbanksc.com
Hibret Bank (HB)	Private	1998	http://www.unitedbank.com.et/
Wegagen Bank (WB)	Private	1997	http://www.wegagenbanksc.com/
Oromia Bank (OB)	Private	2008	http://www.orointbank.com/
Lion International Bank (LIB)	Private	2006	http://www.anbesabank.com/

Source: National Bank of Ethiopia's website

3.3 Variables Definition and Measures

In this section, we define the key variables used in our study, including credit risk, loan size, and economic policy uncertainty. We also discuss the definition and direction of control variables in the upcoming table.

3.3.1 Credit Risk

We use the non-performing loan ratio (NPLR) as a proxy measure of Ethiopian commercial credit risk by considering data availability, research topic and national bank of Ethiopia risk regulation. The NPLR is defined as the sum of subordinate, doubtful, and loss loans divided by total loans.

Following loan directive number SBB/43/2007 of the National Bank of Ethiopia, Annisa (2015) defined the components of non-performing loans as follows:

Substandard: loans that are past due for more than 90 days but less than 180 days. Substandard loans are those whose interest or principal payments are more than three months in arrears of lending conditions.

Doubtful: loans that are past due for more than 180 days but less than 360 days. Doubtful loans suggest that the full liquidation of outstanding debts appears doubtful, and the accounts indicate that there will be a loss.

Loss: loans that are past due over 360 days. Loss implies that outstanding debts are considered not collectible.

This measure of credit risk, the non-performing loan ratio, captures the movement in credit risk. The role of non-performing loans (NPLs) as a measure of bank credit risk is supported by various studies, including Chi & Li (2017), Berger & DeYoung (1997), and Louzis et al. (2012).

3.3.2 Loan size

According to Article 4(6) of Directive number SBB/043/2008 of the National Bank of Ethiopia (NBE), Zelalem (2014) defined loans and advances as any financial asset of a bank resulting from direct or indirect advances, such as unplanned overdrafts, participations in loan syndication, purchases of loans from another lender, etc., or commitments to advance funds by a bank to a person that are conditioned on the obligation of the person to repay the funds, either on a specified date or dates or on demand, usually with interest.

Based on the studies conducted by Chi et al. (2017), Qian et al. (2011), Rozina (2021), and others, the researcher designed indicator to measure loan size for commercial banks which is the growth rate of loans (GLs). The loan growth rate represents a bank's loan growth in consecutive years. A positive growth rate of loans indicates an increase in loans from the previous year, and vice versa. A negative GL means a decrease in loans compared to the last year. The higher the GL rate, the stronger the loan increase compared to the previous year.

3.3.3 Economic Policy Uncertainty

Economic Policy Uncertainty (EPU) is a concept that refers to the degree of uncertainty that businesses, investors, and consumers face regarding future economic policies and how they may affect the economy. EPU can arise from a variety of sources, including changes in government policies, political instability, and global economic developments.

In this study, we use the Uncertainty Index developed by Ahir et al. (2018) to measure economic policy uncertainty. We average quarterly values of the uncertainty index to obtain an annual value and to make compatible with annual-level bank data. Higher values of the index indicate higher policy uncertainty in a country.

There are several factors that have contributed to economic policy uncertainty in Ethiopia in recent years. Here are some of the main factors:

Political instability: Ethiopia has experienced significant political instability in recent years, including protests, ethnic tensions, and a state of emergency in some regions. This has created uncertainty for businesses and investors (World Bank, 2020).

Foreign exchange shortage: Ethiopia has a chronic shortage of foreign exchange, which has contributed to uncertainty in the economy. The shortage has led to difficulties for businesses in importing raw materials and machinery, and has limited the government's ability to pay for imports (IMF, 2020).

Inflation: Inflation has been high in Ethiopia in recent years, which has contributed to uncertainty for businesses and consumers. Inflation erodes the value of money and makes it more difficult for businesses to make long-term plans (World Bank, 2020).

Poor infrastructure: Ethiopia has limited infrastructure, including inadequate transportation networks and unreliable energy supply, which has created uncertainty for businesses and investors (African Development Bank, 2019)

Weak institutional capacity: Ethiopia has a weak institutional capacity, which has limited the government's ability to implement policies effectively and has contributed to uncertainty in the economy (World Bank, 2020).

3.3.4 Control Variables

To account for potential confounding factors, we introduce additional variables into our model as control variables or interaction variables with economic policy uncertainty. The definitions and measures of these variables are presented below.

Loan to Deposit Ratio (LTDR): Banks use the money deposited by their customers to provide loans to borrowers. The LTDR is the ratio of loans provided by the bank to its deposit base. A high LTDR indicates that the bank is lending more money than it has available in deposits, which means that the bank is relying on other sources of funding to meet its lending needs.

However, when a bank has a high LTDR, it may become more vulnerable to default risk. If borrowers are unable to repay their loans, the bank may not have enough funds to cover the losses. This can lead to an increase in NPLs, which are loans that have not been repaid for a certain period of time. Similarly high LTDR can increase the risk of NPLs because the bank may

be lending more money than its deposit base can support. If the bank is unable to recover the loans, it may face financial difficulties and may not be able to repay its depositors, which can lead to a further deterioration of its financial health (Chen & Liao, (2016)

Bank Size (Size): Bank size is defined as the natural logarithm of the value of total assets. Some studies suggest that larger banks have a comparative advantage in lending due to their ability to diversify risk and their access to lower-cost funding sources. According to Berger and Udell (2006) and Uchida et al. (2007), bank size is considered an important determinant of bank lending decisions. Large banks tend to engage more in risky activities and be financed more with short-term debt, which makes them more vulnerable to generalized liquidity shocks and market failures such as liquidity shortages and fire sales (Kashyap et al., 2002; Vishny, 2013). However, big banks are usually more diversified in their income. According to Salas and Saurina (2002), Curak, Pepur, and Poposki (2013), there is a negative association between non-performing loans (NPLs) and bank size because large banks have better risk management strategies.

Lending Interest Rate (LIR): The lending interest rate is the rate that a bank charges to its customers for borrowing money, usually in the form of a loan. There is empirical evidence of a positive correlation between the interest rate and NPLs. An increase in interest rates weakens the loan payment capacity of the borrower; therefore NPLs and bad loans are positively correlated with interest rates (Nkusu et al., 2011; Hoque and Hossain, 2008).

Lending interest rates can have a significant impact on loan growth. Higher lending interest rates can discourage borrowing and lead to slower loan growth, while lower interest rates can stimulate borrowing and lead to faster loan growth (De Bondt and Maddaloni, 2003). The lending interest rate can be influenced by the overall economic environment, including inflation, monetary policy, and economic growth. For example, if inflation is high, the central bank may raise interest rates to control inflation, which can impact the lending interest rate and the borrower's credit decision.

Gross Domestic Product (GDP): Gross Domestic Product (GDP) is the monetary value of goods and services produced within a country's borders in a given time period. A strong economic condition measured by GDP is a motivating factor for banks to issue more private credit to businesses (Kashif and Mohammed, 2008).

According to Claessens & Kose, (2018) a strong economy with high levels of GDP growth can reduce the NPL ratio by increasing the ability of borrowers to service their debts. This is because a growing economy provides more job opportunities and higher incomes, which can improve the financial position of borrowers. On the other hand, a weak economy with low levels of GDP growth can increase the NPL ratio by making it more difficult for borrowers to service their debts. This is because a weak economy can lead to job losses, lower incomes, and reduced economic activity, which can increase the risk of default among borrowers (Jimenez & Saurina, 2006). A recession may cause difficulties for borrowers to maintain their debt obligations, leading to a growing number of NPLs.

Inflation: Inflation is typically a broad measure, such as the overall increase in prices or the increase in the cost of living in a country. Inflation can have a complex impact on non-performing loans (NPLs) in a banking system. On the one hand, inflation can reduce the real value of outstanding loans, making it easier for borrowers to repay their debts. This is because inflation can increase the nominal value of assets and incomes, which can make it easier for borrowers to meet their debt obligations (Allen & Gale, 2000).

On the other hand, Agénor (2000) suggested inflation can also increase the cost of borrowing, which can make it more difficult for borrowers to service their debts. This is because inflation can lead to higher interest rates, which can increase the cost of borrowing and reduce the affordability of debt for borrowers.

Inflation can increase the cost of funds for banks, as they may need to pay higher interest rates to attract deposits and borrowings. This, in turn, can lead to higher lending rates, which can reduce the demand for credit. In addition, inflation can increase the risk of default, as borrowers may find it more difficult to repay their loans in an inflationary environment, which can make banks more cautious about extending credit. Agarwal and Baron (2019) found that banks that were most exposed to inflation were most likely to reduce their lending.

Capital Adequacy (CAR): Capital adequacy is the amount of own funds available to support the bank's business and act as a buffer in case of adverse situations. Capital adequacy is a measure of the overall financial strength of a bank. Banks with adequate capital ratios experience lower rates of NPLs (Sinkey and Greenawalt, 1991). However, banks with high levels of capital adequacy

might be encouraged to embark on riskier activities leading to riskier credit portfolios (Saba et al., 2012; Rime, 2011). It means Banks with high levels of capital adequacy may be incentivized to take on more risk, as they have a larger buffer to absorb losses. This can lead to a culture of risk-taking within the bank, as employees may feel that they are more insulated from the consequences of risky activities. In addition Banks are under pressure to generate returns for their shareholders, and one way to do this is by taking on riskier activities. Banks with high levels of capital adequacy may feel that they have the cushion to take on riskier activities in order to generate higher returns.

Unemployment Rate (UNR): Unemployment refers to the situation where individuals who are willing and able to work and actively seeking employment are unable to find a job. In other words, unemployment occurs when there is a mismatch between the number of available jobs and the number of job seekers. Unemployment is typically measured as a percentage of the total labor force in a particular geographic area or country. The labor force includes individuals who are either employed or actively seeking employment. The unemployment rate is calculated by dividing the number of unemployed individuals by the total labor force and multiplying by 100 (United States Department of Labor, 2021).

Unemployment can negatively affect the income of individuals, which can increase their debt burden and reduce their consumption. This, in turn, can lead to a higher likelihood of default on loans, which can contribute to the increase in NPLs in the banking sector. Furthermore, high unemployment rates can also lead to a decrease in economic activity, which can affect the ability of borrowers to repay their loans, and can further increase the risk of NPLs.

Regarding the relationship between unemployment and non-performing loans (NPLs), several studies have found that there is a positive association between the two factors. Vogiazes and Nikolaidou (2011) suggest that income and unemployment rates are the main factors that contribute to loan losses in the banking sector. Similarly, Bofondi and Ropele (2011) and Saba et al. (2012) found that NPLs are positively associated with unemployment rates.

High unemployment can reduce the demand for credit and make it more difficult for banks to find creditworthy borrowers. This is because high levels of unemployment can reduce the income and creditworthiness of potential borrowers, making it more difficult for them to meet

their debt obligations. As a result, banks may become more cautious about extending credit in a high unemployment environment, as they may be concerned about the risk of default. Moreover high unemployment can reduce the willingness of borrowers to take on debt. This is because unemployment can reduce the disposable income of households, making it more difficult for them to service debt. Moreover, high unemployment can increase the risk of default, as borrowers may be more likely to experience financial difficulties in a weak labor market (Berger & Udell, 1994).

Table 3.2 Variable notation and expected effects

Variables	Explanation	Symbol	Measurement	Expected Signs
Dependent variable	Non-performing loan ratio	NPLR	Unpaid Loan divided by Total Credit	NA
	Growth rate of loan	GL	Change in loan in current year divided by loans in previous year	NA
Independent variable	Loan To Deposit Ratio	LTDR	Total loan divided by total deposit	+
	Economic policy uncertainty	EPU	Uncertainty Index developed by Ahir et al. (2018)	+& -
	Bank Size	Size	Natural logarithm of total asset	-&+
	Gross domestic product	GDP	Natural logarithm of annual GDP	-&+
	Capital Adequacy Ratio	CAR	total equity divided by total equity	+/-
	Inflation Rate	INFR	Annual inflation rate	+/-
	Lending interest rate	LIR	Average lending interest rate	+&-
	Unemployment rate	UNR	Annual unemployment rate	+&-

Source: own computation from the theories

3.4. Model Specification

3.4.1 Panel Data

In econometrics and statistics, panel data combines the characteristics of cross-sectional and time-series data, as it allows the observation of individual cross-sectional units through multiple variables and time. Panel data analysis provides tools for more complex methods of observing effects that may not be detectable compared to a cross-sectional or time-series analysis alone (Ben-Porath, 1973; Heckman et al., 1998; Hsiao et al., 2006; Rosenbaum and Rubin, 1985).

A panel data set will consist of N sets of observations on individuals to be denoted by i = 1,…,N observed in t periods, where t=1,...,T.

One of the main advantages of using panel data is that panel data sets are usually larger than cross-sectional or time series data sets and explanatory variables vary over two dimensions (individuals and time) instead of one. Because of this, estimators based on panel data are often more accurate than those from other sources, even with identical sample sizes. The use of a panel data set can often yield more efficient estimators than a series of independent cross-sections (where different units are sampled in each period) (Hsiao et al., 1995). Another advantage of panel data is that it can help to reduce identification problems. In many cases, panel data analysis can address identification issues in the presence of endogenous regressors or measurement error, improve robustness to omitted variables, and allow for the identification of individual dynamics (MaCurdy, 1981).

3.4.2 Fixed Effect (FE) Regression Model

A fixed effect panel analysis is most appropriate when the individuals in the sample cannot be considered as a random draw from some underlying population, particularly when i (individual cross sections) represent countries, large companies, or industries, and the predictions being made are for a particular country, company, or industry. Since banks are large companies, a fixed-effect model is a suitable approach. One reason for this is that the constant term is of interest, particularly when the number of units is relatively small and of a particular nature.

In a fixed panel, the same set of individuals is observed for the duration of the study. This allows for the specification and estimation of more complex and realistic models than a single cross-section or a single time series could achieve. The availability of repeated observations on the same units enables a more in-depth analysis of the data and can provide insights that would not be possible with other data structures.

Using a fixed effect panel analysis is most appropriate when the individuals in the sample cannot be considered as a random draw from some underlying population. This interpretation is especially suitable when i (individual cross sections) represent countries, large companies, or industries, and the predictions being made are for a particular country, company, or industry. Since banks are large companies, interpreting the data using fixed-effect models is most appropriate. One reason why one might prefer the fixed effects estimator is that some interest lies in the constant term, particularly when the number of units is relatively small and of a specific nature.

A fixed panel is one in which the same set of individuals is observed for the duration of the study. The availability of repeated observations on the same units allows for the specification and estimation of more complex and realistic models than would be possible with a single cross-section or a single time series. This can provide insights that would not be possible with other data structures.

Index all variables by **i** for the individual **(i = 1,….,N)** and **t** for the time period **(t = 1,…,T).**

In very general terms, we could specify a linear model as,

$$\mathbf{y_{it} = \beta_{it} x'_{it} + \varepsilon_{it}}$$

Where β_{it} measures the partial effects of x'_{it} explanatory variables in period **t** (time periods) for unit **i** (individual units).

This model is much too general to be useful, and we need to put more structure on the coefficients $\boldsymbol{\beta_{it}}$. The standard assumption, used in many empirical cases, is that $\boldsymbol{\beta_{it}}$ is constant for all **i** and **t,** except possibly the intercept term. This could be written as

$$y_{it} = \beta_i + \beta x'_{it} + \varepsilon_{it}$$

where $\mathbf{x_{it}}$ is a **K** dimensional vector of explanatory variables, not including a constant and we assume that all $\mathbf{x_{it}}$ are independent of all $\boldsymbol{\varepsilon_{it}}$.

The $\boldsymbol{\beta_i}$ thus captures the effects of those variables that are specific to the i^{th} individual and that are constant over time. The fixed effects approach takes $\boldsymbol{\beta_i}$ to be a group-specific constant term in the regression model.

In the standard case, $\boldsymbol{\varepsilon_{it}}$ is assumed to be i.i.d. over individuals and time, with mean **0** and variance $\boldsymbol{\sigma^2_{\varepsilon}}$. If we treat the $\boldsymbol{\beta_i}$ as n fixed unknown parameters, the model stated above is referred to as the standard fixed effects model.

To investigate the impact of EPU on Ethiopian commercial banks' lending decisions and credit risk, as well as to test the first hypothesis (H1), we will utilize a fixed effect panel regression model. Previous studies by Cai and Zeng (2012), Zhang and Wang (2012), Li and Yang (2015), Rachdi and Ghazouani (2011), Harrikari (2019), Chi and Li (2017), among others, suggest that credit risk can be influenced by various factors, such as a economic policy uncertainty (EPU) bank's total assets (SIZE), inflation rate(INFR), capital adequacy ratio(CAR), gross domestic product (GDP), and lending interest rate(LIR), loan to deposit ratio (LTDR) and unemployment rate (UNR).

$$\mathbf{Creditrisk_{i,t}[NPLR]} = \alpha_0 + \alpha_1 EPU_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 LIR_{i,t} + \alpha_4 GDP_{i,t} + \alpha_5 LTDR_{i,t} + \alpha_6 CAR_{i,t} + \alpha_7 UNR_{i,t} + \alpha_8 INFR_{i,t} + \varepsilon_{i,t}$$

Where, t=1,….,T and i=1,…,N, i implies commercial banks and t implies time period the study covers.

The dependent variable in our study is credit risk, which we measure as the non-performing loan ratio (NPLR). The independent variable is economic policy uncertainty (EPU), and we control for bank size (SIZE), capital adequacy ratio (CAR), annual gross domestic product (GDP), annual inflation rate (INFR), lending interest rate (LIR), loan to deposit ratio (LTDR) and unemployment rate (UNR). Recent literature, including Ahir et al. (2018) and Bloom (2014),

suggests that uncertainty is counter-cyclical and is typically higher in developing countries. Therefore, we include GDP and inflation rate variables in Equation (1) to control for domestic business cycles, which will help to address concerns that the uncertainty index may represent domestic business cycles.

Previous studies by He & Niu (2018), Liu et al. (2012), Calem and Rob (1999), Chi and Li (2017) suggest that loans are a bank's primary assets, and asset management mainly refers to loan management. Assets and liabilities have a U-shaped relationship, which means that when credit loans increase to a certain level, a further increase generates greater risk. When uncertainty increases, banks face increased credit risk and deterioration of asset quality. Based on this, we adopt the following fixed effect (within) panel regression model to test the second hypothesis (H2).

$$\mathbf{Loan}_{i,t}\ \mathbf{[GRL]} = \beta_0 + \beta_1 EPU_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 LIR_{i,t} + \beta_4 GDP_{i,t} + \beta_5 CAR_{i,t} + \beta_6 UNR_{i,t} + \beta_7 INF_{i,t} + \varepsilon_{i,t}$$

The dependent variable is loan size (lending decision) measured by GL (growth rate of lending). The same independent and control variables as in the first regression model are used here, except we exclude loan to deposit ratio here.

3.5. Panel Unit Root Test

In panel data analysis, estimators may not be efficient if the panel variables are nonstationary. Therefore, it is essential to conduct reliable unit root testing as a critical step in any panel data analysis. First-generation panel unit root tests, such as those developed by Maddala and Wu (1999), Hadri (2000), and Levin et al. (2002), assume homogeneity across all cross sections. The null hypothesis of the panel unit root test assumes stationarity of the Y series, while the alternative hypothesis assumes nonstationarity. Several panel unit root tests have been proposed in the literature, with Westerlund and Breitung (2009) suggesting that the Levin, Lin, and Chu (2002) test has greater local power.

To test the stationarity of each variable, we implement the Levin et al. (2002) panel unit root test, which examines the null hypothesis of a panel unit root:

H0: the series has a unit root.

If the p-value of z(t) is not significant, the series is not stationary. If z is less than or equal to 0.05, then we reject the null hypothesis H0 that the series has a unit root. If there are no unit roots, then we conclude that the series is stationary.

3.6. Estimation Bias

Panel data estimations require careful attention to the issue of bias, as there are several sources of potential bias that can arise in the estimation process. One important issue is the identification of possible biases in the estimator fit, which can lead to inaccurate estimates of the effects of the explanatory variables. Another issue is the presence of unobserved effects, which can bias the estimates of the effects of the explanatory variables if they are correlated with the explanatory variables. Panel data analysis requires careful consideration of the correlations between observations and residuals, as these can affect the accuracy of the estimates and lead to biased results.

Croissant and Millo (2008) propose a comprehensive set of tests for panel data analysis, including tests for heteroskedasticity, autocorrelation, and multicollinearity, as well as tests for model specification and model fit. These tests can help to ensure that the results of panel data analysis are appropriate and robust, and can help to identify any potential sources of bias or other problems in the analysis.

3.6.1. Multicollinearity

Regression analysis often encounters the problem of multicollinearity, which arises when two or more independent variables in a regression model exhibit a strong correlation with each other. This correlation indicates that one independent variable can be predicted from the other independent variable in the model. When two or more independent variables contain overlapping information, it becomes difficult to compute the effect of each variable individually. This can lead to less reliable statistical inferences and affect the interpretation of the results (Belsley, 1991).

Multicollinearity among independent variables can result in unstable and inconsistent estimates of the regression coefficients. This is because the presence of multicollinearity raises the standard errors of the regression coefficients, making it more difficult to detect the true effect of each variable on the dependent variable. In addition, multicollinearity can lead to over fitting of the model, which can result in poor out-of-sample performance.

To test for multicollinearity, a correlation matrix is often used. The correlation matrix shows the correlation coefficients between each pair of independent variables in the model. High correlation coefficients (usually above 0.8 or 0.9) suggest the presence of multicollinearity.

3.6.2 Autocorrelation

Autocorrelation is a statistical concept that refers to the degree of correlation between the same variable in two successive time intervals. In simpler terms, serial correlation occurs when observations in a particular period are not random but rather dependent on previous observation periods. Autocorrelation is a statistical measure that assesses the relationship between the original version of a variable and its lagged version in a time series (Box and Jenkins, 1976).

Autocorrelation can arise due to various reasons, such as carryover effects, deletion of some variables, misspecification, and measurement error. The Breusch-Godfrey test (Asteriou & Hall, 2011) is a useful tool for detecting serial correlation. This test is designed to detect the presence of autocorrelation in the residuals of a regression model. By detecting and correcting for autocorrelation, we can improve the accuracy and reliability of our statistical analysis.

$$\varepsilon_t = \rho_1\varepsilon_{t-1} + \rho_2\varepsilon_{t-2} + \ldots + \rho_q\varepsilon_{t-q} + v_t$$

With a null hypothesis:

$$H_0 = \rho_1 = \cdots = \rho_q = 0$$

3.6.3. Heteroskedasticity

Heteroskedasticity in regression analysis is a condition where the variance of the residuals is not uniform across a range of measured values. This means that the overall variance of the residuals rise or fall as the dependent variable increases. Heteroskedasticity can result from outliers in the data or the exclusion of significant variables from the model (White, 1980).

Regression analysis in the presence of heteroskedasticity can result in inefficiencies due to an underestimation of variance and covariance. To test for heteroskedasticity, the Breusch-Pagan LM test (Woolridge 2013) is often used. This test is designed to detect the presence of heteroskedasticity in the residuals of a regression model. By detecting and correcting for heteroskedasticity, we can improve the accuracy and reliability of our regression analysis. Simply put, the variance can be represented as:

$$\sigma^2_i=\delta_0+\delta_1 x_{i1}+\ldots+\delta_k x_{ik}$$

The null hypothesis in statistical analysis assumes homoscedasticity: $\mathbf{H_0=\delta_1= \ldots =\delta_k=0}$

CHAPTER FOUR: RESULT AND DISCUSSION

This chapter presents the findings of the study and discusses the results in order to achieve the research objectives and form a basis for the conclusion. The data was analyzed using a fixed effect model in Stata 17.

In the first section of this chapter, descriptive statistics were presented and discussed. This included measures such as mean, standard deviation, minimum, and maximum values of the variables under study. The descriptive statistics provided a summary of the data and gave insight into the distribution and characteristics of the variables.

The second section of this chapter presented the panel unit root test for stationary variables. This test was conducted to determine whether the variables were stationary or non-stationary. The results of the panel unit root test were used to select appropriate models for the regression analysis.

The subsequent sections included model selection, regression results and post estimation tests. The regression analysis was conducted using a fixed effect model, which allowed for the control of individual heterogeneity. The regression results presented the coefficients, standard errors, t-values, and p-values of the variables under study. The regression analyses were conducted to examine the effect of economic policy uncertainty on credit risk and bank lending decision on Ethiopian selected commercial banks. And the result of the regression was discussed in detail here.

4.1 Descriptive Statistics

Table 4.1 presents the descriptive statistics for the independent and dependent variables used in the study of Ethiopian commercial banks. The dependent variables are the nonperforming loans ratio and the growth rate of loans. The independent variable is economic policy uncertainty, which is controlled for the macroeconomic variables (gross domestic product, inflation rate, and unemployment rate) and bank-specific variables (loan-to-deposit ratio, lending interest rate, capital adequacy, and bank size). The dataset consists of 120 observations for each variable, covering a period of 12 years from 2010 to 2021.

The descriptive statistics provide a summary of the key features of the dataset, including the mean, standard deviation, minimum, and maximum values for each variable. This information gives an overview of the overall trend of the data over the period under consideration. The following is a detailed description of each variable:

Nonperforming loans ratio: This is the ratio of nonperforming loans to the total amount of loans. It is a measure of the quality of a bank's loan portfolio, with higher values indicating a higher level of risk.

Growth rate of loans: This is the rate of change in the total amount of loans over time. It is a measure of the level of lending activity by banks.

Economic policy uncertainty: This variable measures the level of uncertainty in the economic policy environment. Higher values indicate greater uncertainty, which can impact the decision-making of banks and borrowers.

Gross domestic product: This is the total value of goods and services produced by a country over a period of time. It is a measure of the overall level of economic activity and can impact the performance of banks.

Inflation rate: This is the rate at which the general level of prices for goods and services is rising over time. It is a measure of the level of inflation in the economy, which can impact the performance of banks.

Unemployment rate: This is the percentage of the labor force that is unemployed. It is a measure of the level of unemployment in the economy, which can impact the performance of banks.

Loan-to-deposit ratio: This is the ratio of loans to deposits. It is a measure of the liquidity of a bank and its ability to meet the demands of its customers.

Lending interest rate: This is the rate at which a bank charges interest on its loans. It is a measure of the cost of borrowing for borrowers and can impact their credit decisions.

Capital adequacy: This is a measure of a bank's ability to absorb losses and continue operating without defaulting on its obligations. Higher values indicate a more stable and secure bank.

Bank size: This is the size of a bank, measured by its total assets. It is a measure of the scale of a bank's operations and can impact its performance and risk profile.

The mean (maximum) value for NPLR of the sample banks is 3.519 (16.1%) while the minimum and standard deviation of this key variable are 1.0% and 1.921. the mean value implies that, from the total loans that Ethiopian commercial banks disbursed, an average of 3.5% were being default or uncollected over the sample period. Even though the average value of these bad debt were relatively not intense, the maximum value of non-performing loan is unacceptable by the national bank of Ethiopia minimum bad debt settings, on average NPLs ratio of Ethiopian commercial banks is below the maximum threshold. Since in Ethiopian context, the banking sectors are required to maintain the ratio of NPLs at least below 5% (NBE, 2008).

Table 4.1 descriptive statistics of variables

Variables	***Observations***	***Minimum***	***Mean***	***Maximum***	***Standard Deviation***
NPLR (%)	**120**	**1.00**	**3.519**	**16.1**	**1.921**
GL (%)	**120**	**-29.5**	**31.581**	**239.0**	**29.25**
LTDR (%)	**120**	**36.5**	**64.809**	**109.9**	**13.07**
EPU	**120**	**0.016**	**0.1298**	**0.334**	**0.101**
SIZE	**120**	**21.06**	**23.792**	**27.62**	**1.312**
GDP	**120**	**26.66**	**27.899**	**29.10**	**0.689**
CAR	**120**	**0.090**	**0.1328**	**0.211**	**0.031**
LIR(%)	**120**	**11.88**	**12.729**	**14.30**	**0.915**
UNR(%)	**120**	**3.110**	**11.853**	**18.90**	**6.891**
IFLR(%)	**120**	**6.600**	**15.070**	**32.0**	**8.280**
EXR(%)	**120**	**12.89**	**22.687**	**39.01**	**7.035**

Source: own computation from stata 17 output

The loan growth rate of sampled Ethiopian commercial banks ranged from -29.5% to 239.0% in the study period, with a mean of 31.58% with wide variation across banks and years and a lower standard deviation of 29.25. The standard deviation of 29.25% implies that there was variation in terms of loan growth among Ethiopian commercial banks. Even though some banks' loan growth rates are high, on average, Ethiopian commercial banks registered a loan growth rate of less than 50 percent. The minimum loan growth, which is negative, means banks loans are lower in the current year in comparison with the previous fiscal year, which could be due to recessions in banks, it could be due to differences in demand and supply, or a combination of both. Due to these and some other reasons the negative value of loan growth rate implies there were some banks whose loan were lower than the last experienced period. The growth of loans increases interest income, which is considered the main source of income for banks, but increases in lending due to supply shifts, will tend to lead to higher loan losses in the future.

Looking at the LTDR, which was measured by total loans divided by total deposits in the same period, it ranges from a minimum value of 36.5% to a maximum value of 109.9%. It has a mean value of 64.81%. The wide range of values for the loan-to-deposit ratio variable suggests that some banks may be more heavily reliant on borrowing to fund their lending activities than others. The loan-able funds may come from development banks to motivate and support the production sector. For instance for the last few years, the Development Bank of Ethiopia has provided funds to commercial banks to lend money to the manufacturing, agro-processing, construction, and tourism sectors. However, this high loan-to-deposit ratio creates problems for banks in covering any unfrozen fund requirements, or it could indicate the danger of running short of liquidity. There was dispersion of LTDR towards its mean value among banks, as shown by the standard deviation of 13.07%.

The mean (maximum) value of EPU is 0.1298 (0.334), with a lower standard deviation from the mean is 0.10047. The higher EPU (economic policy uncertainty) means that there is a greater level of uncertainty surrounding economic policy decisions. This can result in decreased confidence and investment from businesses and individuals, which can lead to slower economic growth and increased risk for financial institutions, including banks.

Bank size is the natural logarithm of total assets, which ranges from a minimum of 21.06 to a maximum value of 27.62, with the mean value and standard deviation of 23.79 and 1.31,

respectively. This 1.31 standard deviation indicates the existence of low variation among Ethiopian commercial banks in terms of their asset sizes. But these low variation standard deviation was due to the billions value asset of banks were normalized by natural logarithm. The maximum asset size is registered by the Commercial Bank of Ethiopia, while the minimum asset size emanates from Oromia Bank.

The capital adequacy ratio, measured by total equity divided by total assets, presents a minimum value of 0.09 (9%) and a maximum value of 0.211 (21.1%), with a mean value and standard deviation of 0.1328 and 0.03104, respectively. This indicates that CAR for the sample commercial banks in Ethiopia during the study period was above the minimum requirement, which is 8% under Basel II and NBE under NBE Directive No. SBB/50/2011 and 10.5% under Basel III with a 2.5% conservation cushion. This high capital adequacy ratio of Ethiopian commercial banks from the minimum setting gives them the ability to withstand a financial downturn and any other unfrozen losses since this higher ratio signals safety for the bank.

The minimum and maximum loan interest rates were 11.88% and 14.30% and with mean and standard deviation of 12.729 and 0.915. This macroeconomic variable was higher in the study period compared to developed countries.

The unemployment rate takes values between 3.05 and 18.9. The mean of 11.85 and standard deviation of 6.89 suggest that, on average, the unemployment rate is 11.85%, with a fair amount of variation across years.

Further, in the study period, the general price level of Ethiopia registered a minimum and maximum value of 6.60% and 32.00%, respectively. The mean and higher standard deviation was also 15.07% and 8.28%, respectively. On average, in Ethiopia, the inflation rate was high and recorded galloping inflation growth, which reached a rate in the double digits; furthermore, the maximum inflation recorded, which was 32% a year, is a way reaching a hyperinflation rate. The rate of inflation was dispersed over the periods under study towards its mean, with a standard deviation of 8.28%.

4.2 Panel Unit Root Test

A number of panel unit root tests proposed in the literature by Westerlund and Breitung (2009) show that the local power of the Levin, Lin, and Chu (2002) test is greater. We test for the stationary nature of each of the variables included in the study by implementing the Levin et al. (2002) panel unit root test, which examines the null hypothesis of a panel unit root. This means that the null hypothesis states that the series has a unit root, while the alternative hypothesis states that the series is stationary. Since the p-value of the series is less than 0.05 for each variable, the results in Table 4.2 suggest that all variables under investigation are panel stationary at level and first difference, so we cannot find bias in our estimation.

H0: Panels contain unit roots

Ha: Panels are stationary

Table 4.2 stationarity test for panel unit root

Variables	Statistics	p-value	Stationarity
NPLR	-3.6033	0.0002	Stationary at Level
GL	-2.6302	0.0043	Stationary at Level
EPU	-5.0420	0.0000	Stationary at Level
UNR	-2.1397	0.0162	Stationary at Level
INF	-5.1447	0.0000	Stationary at Level
CAR	-2.3215	0.0101	Stationary at Level
LTDR	-4.1589	0.0000	Stationary at First Difference
GDP	-4.9685	0.0000	Stationary at First Difference
SIZE	-2.4769	0.0066	Stationary at First Difference
LIR	-1.9650	0.01673	Stationary at First Difference

Source: own computation from stata 17 output

All the variables under study are stationary at level and first difference. Therefore we fail to accept the null hypothesis and accept the alternative hypothesis stating panels are stationary.

4.3 Model Specification Test

4.3.1 Hausman Test for Model Selection

According to Brooks (2008), Verbeek (2004), and Wooldridge (2004), it is often said that the random effect model (REM) is more appropriate when the entities in the sample can be thought of as having been randomly selected from the population, but a fixed effect model (FEM) is more plausible when the entities in the sample effectively constitute the entire population or sample frame. In addition to Brooks (2008), Verbeek (2004), and Wooldridge (2004), Gujarati (2004), if T (the number of time series data) is large and N (the number of cross-sectional units) is small, there is likely to be little difference in the values of the parameters estimated by the fixed effect model (FEM) and the random effect model (REM). Hence, the choice here is based on computational convenience. On this score, FEM may be preferable. Since the number of time series (i.e., 12 years) is greater than the number of cross-sectional units (i.e., 10 commercial banks), FEM is preferable in this case.

Fixed effect model interpretation is probably most appropriate when individual cross sections denote countries, large companies, or industries, and the predictions we want to make are for a particular country, company, or industry. Since banks are large companies, interpretation by fixed-effect models is more appropriate.

Hausman (1978) has suggested a test for the null hypothesis that x_{it} and α_i are uncorrelated. The general idea of a Hausman test is that two estimators are compared, one of which is consistent under both the null and alternative hypotheses, which is a fixed effect, and the other is only consistent under the null hypothesis, which is a random effect. The Hausman test tests whether the individual characteristics are correlated with the regressors (Green, 2008). The null hypothesis is that they are not random effects. The reason is being the correlation between α_i and x_{it} in which case the random effects approach, ignoring this correlation, leads to inconsistent estimators.

To formally test whether a fixed effects (FE) or random effects (RE) model is more appropriate for the first panel data model:

$$\mathbf{Creditrisk_{i,t}[NPLR]=\alpha_0 +\alpha_1 EPU_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 LIR_{i,t} + \alpha_4 GDP_{i,t} + \alpha_5 LTDR_{i,t} + \alpha_6 CAR_{i,t} + \alpha_7 UNR_{i,t} + \alpha_8 INFR_{i,t} + \varepsilon_{i,t}}$$

where NPLR is the dependent variable for individual i at time t, EPU, LTDR**,** SIZE, GDP, LIR, CAR, UNR and INFR are independent variables, α_0 is the intercept, α_1 to α_8 are the coefficients of the independent variables, and $\varepsilon_{i,t}$ is the error term, we can use the Hausman test.

Hausman test

Test: Ho: difference in coefficients not systematic
chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 27.43
Prob > chi2 = 0.0006

(V_b-V_B is not positive definite)

Source: stata 17 result for hausman test

From the above statistical result, the Hausman test is based on the null hypothesis that the difference between the coefficients of the two models is not systematic. A significant result suggests that the FE model is preferred over the RE model, while a non-significant result suggests that the RE model should be preferred. The p-value of the Hausman test is 0.0006, which is less than the usual significance level of 0.05. This indicates that the difference between the coefficients of the FE and RE models is statistically significant. Therefore, we should reject the null hypothesis and conclude that the FE model is preferred over the RE model.

Again to formally test whether a fixed effects (FE) or random effects (RE) model is more appropriate for the panel data model which shows the effects of economic policy uncertainty on lending decision of Ethiopian commercial banks:

$$\mathbf{Loan_{i,t}[GRL]= \beta_0+ \beta_1 EPU_{i,t}+ \beta_2 SIZE_{i,t} + \beta_3 LIR_{i,t} + \beta_4 GDP_{i,t} + \beta_5 CAR_{i,t} + \beta_6 UNR_{i,t} + \beta_7 INF_{i,t} + \varepsilon_{i,t}}$$

Hausman test

Test: Ho: difference in coefficients not systematic
chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 16.40
Prob > chi2 = 0.0217

(V_b-V_B is not positive definite)

Source: stata 17 result for hausman test

The test statistic (chi-squared) 16.40 with the p-value 0.0217 indicates that the difference between the coefficients of the FE and RE models is statistically significant at the 5% level of significance. Therefore, we reject the null hypothesis and conclude that the difference in the coefficients is systematic. The result suggests that the FE model is preferred over the RE model, as it provides a better fit to the data. This may be due to the presence of time-invariant unobserved heterogeneity that is not accounted for in the RE model, which can bias the estimated coefficients and standard errors. The FE model, on the other hand, controls for time-invariant unobserved heterogeneity by including individual-specific fixed effects.

Overall, the results of the Hausman test for the above two regression models suggest that the fixed-effects estimator is more appropriate, because it produces more accurate coefficient estimates for the variables of interest.

4.4. Results and Discussions

4.4.1 Nonperforming Loan Ratio and Economic Policy Uncertainty (EPU)

The operational fixed effect panel regression model used to find the effects of economic policy uncertainty on the credit risk of Ethiopian commercial banks, which is measured by the non-performing loan ratio, was:

$$\mathbf{Creditrisk_{i,t}[NPLR]=\alpha_0+\alpha_1 EPU_{i,t}+\alpha_2 LTDR_{i,t}+\alpha_3 SIZE_{i,t}+\alpha_4 GDP_{i,t}+\alpha_5 LIR_{i,t}+\alpha_6 CAR_{i,t}+\alpha_7 UNR_{i,t}+\alpha_8 INFR_{i,t}+\varepsilon_{i,t}}$$

Table 4.3 Effect of economic policy uncertainty on credit risk

. xtreg NPLR EPU SIZE LIR GDP LTDR CAR UNR INFR,fe

F(8,56) = 5.01
corr(u_i, Xb) = -0.7018 Prob > F = 0.0001

NPLR	Coefficient	Std.err.	t	P>|t|	[95%	conf.interval]
EPU	6.407764	2.047533	3.13	0.003	2.306063	10.50946
SIZE	-4.070382	1.03468	-3.93	0.000	-6.143095	-1.99767
LIR	2.054566	.4407455	4.66	0.000	1.171647	2.937485
GDP	-1.647795	.8644118	-1.91	0.062	-3.37942	.0838303
LTDR	.0607723	.0350444	1.73	0.088	-.0094301	.1309746
CAR	10.91169	6.162864	1.77	0.082	-1.434009	23.25739
UNR	.0493505	.0319993	1.54	0.129	-.0147518	.1134528
INFR	.0118789	.0181777	0.65	0.516	-.0245355	.0482933
_cons	63.59541	23.82533	2.67	0.010	15.86754	111.3233

Source: stata 17 result for the first model

This section discusses in detail the results of economic policy uncertainty and control variables and their importance in determining credit risk in Ethiopian commercial banks. Furthermore, the discussion analyzes the statistical findings of the study in relation to previous empirical evidence. Hence, the following discussions present the interpretation of the fixed effects model regression results and the relationship between explanatory variables and credit risk.

The above result is from fixed-effects (within) regression of the non-performing loan ratio (NPLR) on several macroeconomic and bank-specific variables, controlling for bank fixed effects. The regression includes the following independent variables: economic policy uncertainty index (EPU), loan-to-deposit ratio (LTDR), total assets of banks (SIZE), annual GDP (GDP), bank's lending interest rate (LIR), capital adequacy ratio (CAR), unemployment rate (UNR), and inflation rate (INFR).

The overall F-test is significant at the 1% level, with a p-value of 0.0001. This indicates that the model as a whole is statistically significant and can explain a significant portion of the variation in credit risk among the Ethiopian commercial banks in the sample.

The results of the regression suggest that several of these variables are statistically significant predictors of the non-performing loan ratio. Specifically, the economic policy uncertainty index (EPU), total assets (SIZE), bank's lending interest rate (LIR), and the constant term are all statistically significant predictors of the non-performing loan ratio at the 95% confidence level or higher. The results for gross domestic product (GDP), loan to deposit rate (LTDR) and capital adequacy ratio (CAR) are statistically significant at 90% confidence level.

The above fixed effect regression found that EPU has a statistically significant positive effect on NPLR, with a coefficient estimate of 6.407764 and a p-value of 0.003. This indicates that an increase in economic policy uncertainty is associated with an increase in non-performing loans in Ethiopian banks, holding all other variables constant. The relationship between EPU and credit risk can be influenced by a number of channels, including the impact of EPU on macroeconomic conditions, the behavior of borrowers and lenders, and the regulatory environment. Bloom, (2009) suggested that, higher levels of EPU can lead to decreased confidence and investment from businesses and individuals, which can result in slower economic growth. This can increase the likelihood of loan defaults and, therefore, increase credit risk.

EPU can lead to changes in lending behavior by banks, as they may become more cautious in their lending decisions and increase their risk premiums. This can lead to a tightening of credit conditions, which can have a negative impact on economic activity and increase credit risk (Kamarudin & Nawawi, 2018). According to Baker, Bloom & Davis, (2012), EPU can also affect macroeconomic conditions, such as interest rates, exchange rates, and inflation, which can

in turn affect the creditworthiness of borrowers and the value of collateral. For example, higher interest rates can increase the cost of borrowing and reduce the ability of borrowers to repay loans, leading to higher NPLs. Higher levels of EPU can also lead to regulatory uncertainty, as policymakers may be less willing or able to provide clear guidance on issues such as capital requirements, loan classifications, and other regulatory measures. This can increase the risk of noncompliance by banks and lead to higher NPLs (Hossain & Islam, 2018).

Many empirical findings support the above results like Karadima and Louri (2020), who find that EPU has a positive relationship with the size of bank nonperforming loans, Also, Danisman et al. (2021) find that in times of high EPU, NPLs have a high positive correlation that is statistically significant at the 1% level, which confirms the expectation of a positive relationship between EPU and nonperforming loans in the literature (Ozili, 2018; Caporale et al., 2018). A study by Chi and Li (2017) on similar issue also shows significantly positive connections between policy uncertainty and non-performing loan ratios.

In contrast, bank size has a statistically significant negative effect on NPLR, with a coefficient estimate of -4.070382 and a p-value of 0.000. This suggests that larger banks in Ethiopia tend to have lower levels of non-performing loans, holding all other variables constant.

Larger banks may have advantages when it comes to managing credit risk. For example, they may have more resources to devote to risk management, which can help them identify and manage credit risks more effectively. Additionally, larger banks may have more diversified loan portfolios, which can reduce their exposure to sector-specific or borrower-specific risks.

The size of a bank can affect its risk exposure and the level of credit risk in the banking system. According to Berger and Bouwman (2013), large banks may be more exposed to systemic risks due to their complex organizational structures, which can increase their credit risk. In addition, larger banks may be more inclined to engage in risky behavior, such as taking on excessive leverage or engaging in speculative investments, which can further increase their credit risk. Berger and Bouwman (2013) found that the risk sensitivity of bank capital is greater for larger banks, indicating that bank size can affect the level of credit risk in the banking system. Beltratti and Stulz (2012) found that larger banks are more likely to use sophisticated risk management

tools, such as credit derivatives. This suggests that larger banks may be better equipped to manage credit risk than smaller banks.

In addition to their risk management capabilities, larger banks may also have more access to funding sources, which can provide a buffer against liquidity risk. Overall, the size of a bank can have important implications for its ability to manage credit risk and avoid non-performing loans (NPLs). Larger banks may have advantages when it comes to managing credit risk, including the ability to take advantage of economies of scale to lower their costs of lending and risk management. This can enable them to operate more efficiently and effectively, reducing the likelihood of non-performing loans (NPLs).

Bikker and Metzemakers (2005) found that larger banks have lower costs of credit risk management, which could contribute to their ability to manage credit risk more effectively. Additionally, well-diversified loan portfolios can help reduce credit risk, as Louzis et al. (2012) argue.

Several studies have found a negative relationship between NPLs and the size of a bank, which could be due to the advantages of economies of scale and diversification. These studies include Salas and Saurina (2002), Louzis et al. (2012), Amuakwa-Mensah and Boakye-Adjei (2015), and Ha and Hang (2016).

Loan interest rate (LIR) has a statistically significant positive effect on NPLR, with a coefficient estimate of 2.054566 and a p-value of 0.000. This suggests that higher loan interest rates are associated with an increase in non-performing loans in Ethiopian banks, holding all other variables constant.

The lending interest rate is an important factor in determining the level of credit risk. Higher interest rates can reduce credit risk by providing banks with greater compensation for the risk of default. However, higher interest rates may also increase credit risk by making it more difficult for borrowers to service their debt, particularly during periods of economic downturn. Moreover, changes in lending interest rates can affect the demand for loans, leading to changes in the composition and quality of the loan portfolio (Chen & Hasan, 2021).

The lending interest rate can affect credit risk by influencing the behavior of borrowers and the quality of loans in the market. Higher lending interest rates can make it more difficult for borrowers to service their debt, particularly during periods of economic downturn, which can increase credit risk. Moreover, higher lending interest rates can incentivize banks to pursue riskier loans in order to maintain profitability, which can further increase credit risk. A study by Jiménez et al. (2014) found that higher lending interest rates are associated with higher credit risk, particularly for small and medium-sized enterprises.

GDP also has a statistically significant negative effect on NPLR, with a coefficient estimate of -1.647795 and a p-value of 0.062 at ten percent level of significance. This implies that an increase in GDP is associated with a decrease in non-performing loans in Ethiopian banks, holding all other variables constant.

The state of the economy can have an important impact on credit risk. During periods of economic growth, borrowers are more likely to have the ability to repay their loans, which can decrease credit risk. Conversely, during a period of economic downturn, borrowers may experience financial difficulties, leading to an increase in credit risk. Additionally, GDP growth can affect credit risk by influencing unemployment rates, incomes, and asset prices.

Salas and Saurina (2002) found a significant negative contemporaneous effect of GDP growth on the non-performing loan (NPL) ratio, suggesting that the level of general economic activity is closely tied to credit risk. This could be due to the ability of economic agents to service their loans during periods of economic growth, which can translate to lower credit risk.

GDP growth can affect credit risk by influencing the creditworthiness of borrowers and the performance of specific industries and sectors. During periods of economic growth, borrowers may have more stable employment and income streams, which can improve their creditworthiness and reduce the likelihood of default. Conversely, during economic downturns, borrowers may experience job losses and reduced income, which can increase their risk of default.

In addition, GDP growth can have sector-specific effects, which can have implications for the quality of loans in those sectors. Demirgüç-Kunt and Huizinga (2010) found that GDP growth is negatively related to the probability of loan defaults in the banking sector, suggesting that overall economic activity can influence the likelihood of default.

On the other hand, loan to deposit ratio (LTDR) has a positive coefficient estimate of 0.0607723, it is statistically significant at the 10% level, as its p-value is 0.088. This implies that an increase in LTDR is associated with an increase in non-performing loans in Ethiopian banks, holding all other variables constant.

Demirgüç-Kunt, (2010), suggested banks with higher LTDRs may be more vulnerable to funding risk, as they rely more heavily on deposits to fund their loan portfolios. This can increase the likelihood of NPLs in the event of a funding shock, such as a sudden withdrawal of deposits or an increase in funding costs. Banks with higher LTDRs may also be more vulnerable to liquidity risk, as they may have less liquid assets to sell or pledge as collateral in the event of a funding or market disruption. This can increase the likelihood of NPLs in the event of a liquidity crunch or market downturn (Hasan, (2011). Chong, (2008), confirmed that banks with higher LTDRs may also be more vulnerable to credit risk, as they may have less capacity to absorb losses from NPLs. This can be especially true in cases where banks have high concentrations of loans in a particular sector or to a particular borrower.

Capital adequacy ratio (CAR) has a positive coefficient estimate of 10.91169; it is statistically significant at the 10% level, as its p-value is 0.082. This implies that an increase in CAR is associated with an increase in non-performing loans in Ethiopian banks, holding all other variables constant.

There are evidences to suggest that a higher capital adequacy ratio (CAR) can reduce credit risk, rather than increase it. The reason for this is that a higher CAR provides banks with a larger cushion of capital to absorb losses from potential credit losses, which can reduce the likelihood of default. However, empirical evidences prove that, Banks with high CARs may feel more comfortable taking on greater credit risk, as they have a larger capital cushion to absorb potential losses. This can lead to an increase in credit risk-taking, which can increase the likelihood of default (Blum, 1995). Banks with high CARs may also face greater pressure to maintain

profitability, as they have higher costs of capital. This can lead to an increase in credit risk-taking, as banks seek to generate higher returns by lending to riskier borrowers (DeYoung, 2001).

Theories argue that the inflation rate and unemployment rate have a positive relationship with nonperforming loans. Since Market frictions lead to the rationing of credit, which becomes more severe as inflation and unemployment increases. As a result, the financial sector makes fewer loans, resource allocation is less efficient, and intermediary activity diminishes, with adverse implications for capital and long-term investment. However, the result from the regression is not statistically significant. Therefore we are not confident enough to conclude the effect of unemployment and inflation on credit risk of Ethiopian commercial banks.

4.4.2. Loan Growth (GL) and economic policy uncertainty (EPU)

The operational fixed effect panel regression model used to find the effects of economic policy uncertainty on credit decision of Ethiopian commercial banks, which is measured by the growth rate of loan was:

$$\mathbf{Loan_{i,t}[GRL]= \beta_0+ \beta_1 EPU_{i,t}+ \beta_2 SIZE_{i,t} + \beta_3 LIR_{i,t} + \beta_4 GDP_{i,t} + \beta_5 CAR_{i,t} + \beta_6 UNR_{i,t} + \beta_7 INF_{i,t} + \varepsilon_{i,t}}$$

Table 4.4 effect of economic policy uncertainty on credit risk

xtreg GL EPU SIZE LIR GDP CAR UNR INFR,fe

F(7,57) = 6.74 6.74corr(u_i, Xb) = -0.7765 Prob > F = 0.0000

GL	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
EPU	-60.6602	24.43681	-2.48	0.016	-109.5941	-11.72633
SIZE	52.79218	12.25106	4.31	0.000	28.25985	77.32451
LIR	-16.40074	5.135813	-3.19	0.002	-26.68503	-6.116447
GDP	27.39132	10.3239	2.65	0.010	6.718071	48.06457
CAR	-84.58687	73.76624	-1.15	0.256	-232.3012	63.12747
UNR	.5659043	.3811841	1.48	0.143	-.1974037	1.329212
INFR	.2184621	.2174309	1.00	0.319	-.2169359	.6538601
_cons	-10.725	284.1866	-3.53	0.001	-1572.799	-434.6514

Source: stata 17 result for second model

The above results are from a fixed-effects regression model that examines the relationship between growth rate of loan (GL) and several independent variables, including economic policy uncertainty index (EPU), total assets (SIZE), annual GDP (GDP), lending interest rate (LIR), capital adequacy ratio (CAR), unemployment rate (UNR), and inflation rate (INFR).

The coefficient estimates for EPU, SIZE, GDP, LIR, and the constant term are statistically significant at the 95% confidence level or higher. Specifically, higher levels of economic policy uncertainty and lending interest rate are associated with lower growth rate of loan, while larger banks, higher annual GDP, and lower fixed effects are associated with higher growth rate of loan.

The overall F-test is significant at the 1% level, with a p-value of 0.0000. This indicates that the model as a whole is statistically significant and can explain a significant portion of the variation in credit risk among the Ethiopian commercial banks in the sample.

Specifically, an increase in EPU is associated with a decrease in the growth rate of loans, with a coefficient estimate of -60.6602 and a p-value of 0.016. This suggests that economic policy uncertainty has a negative effect on the growth rate of loans in Ethiopian banks, holding all other variables constant. This implies that banks are more likely to reduce lending in high policy uncertainty environment. Economic policy uncertainty affects the investment scale of enterprises, which in turn affects the credit demand of enterprises on banks, and results in the reduction of bank credit scale. Secondly, economic policy uncertainty directly affects bank credit supply, and credit supply decreases. The indirect mechanism based on credit demand and the direct mechanism based on credit supply jointly lead to the decline of bank credit scale.

Zhang (2020) shows that economic policy uncertainty significantly impedes real investment and reduces net debt issuance for private firms, Bordo and colleagues (2016) discovered that economic policy uncertainty has a significant negative impact on bank credit growth. Demir and Danisman (2021) prove that economic policy uncertainty causes a significant decrease in banking credit growth. Chi and Li (2017) show that policy uncertainty has a negative impact on loan size. They summarized that banks can increase operational performance by reducing loan sizes in light of the rising credit risks caused by policy uncertainty. Economic policy uncertainty greatly slows down the expansion of bank lending, as Hu and Gong (2019) also find.

Economic policy uncertainty can also affect borrowers' investment and financial decisions, which can have a spillover effect on credit demand. When policy uncertainty is high, borrowers may become more hesitant to take on new investments or projects, which can reduce their demand for credit. This can further exacerbate the negative impact of policy uncertainty on lending growth (Bloom, (2014).

In contrast, an increase in bank size is associated with an increase in the growth rate of loans, with a coefficient estimate of 52.79218and a p-value of 0.000. This indicates that larger banks in Ethiopia tend to have higher growth rates of loans, holding all other variables constant.

The finding that large banks provide more loans and advances in Ethiopia is consistent with previous research by Chernykh and Theodossiou (2011), who found that bank size, is a significant factor in loan supply. This supports the market power hypothesis, which suggests that large and complex banks are more diversified, have access to more funds, and are better able to serve large borrowers. Chernykh and Theodossiou (2011) argue that large banks can use their comparative advantage and expertise to acquire sufficient knowledge about the factors affecting credit performance.

The size of a bank can affect its ability to extend credit. Large banks may have more resources to devote to underwriting and risk management, which can enable them to extend credit to a wider range of borrowers. Additionally, large banks may have more access to funding sources, which can enable them to extend more credit.

Furthermore, an increase in loan interest rate (LIR) is associated with a decrease in the growth rate of loans, with a coefficient estimate of -16.40074 and a p-value of 0.002. This suggests that higher loan interest rates may reduce credit growth of banks.

In addition to its impact on the creditworthiness of borrowers, the lending interest rate can also affect the behavior of banks. Higher lending interest rates may incentivize banks to take on riskier loans in order to maintain profitability. Conversely, lower lending interest rates may encourage banks to pursue more conservative lending practices, which can reduce credit risk. Moreover, changes in lending interest rates can affect the overall demand for credit, which can have implications for the quality of loans in the market.

The lending interest rate is a key determinant of bank credit. Higher interest rates can increase the profitability of loans and incentivize banks to extend more credit. However, higher interest rates can also make it more difficult for borrowers to service their debt, which can reduce demand for loans. Conversely, lower interest rates can make loans more affordable and increase demand for credit, but can also reduce the profitability of loans and incentivize banks to reduce their lending activity. Additionally, changes in lending interest rates can affect the composition and quality of the loan portfolio, as borrowers may shift to different types of loans depending on the prevailing interest rate environment. Conversely, lending to the private sector is constrained by rising lending rates and higher public debt consistent with Cottarelli et al. (2003).

An increase in GDP is associated with an increase in the growth rate of loans, with a coefficient estimate of 27.39132 and a p-value of 0.010. This implies that a growing economy may lead to higher growth rates of loans in Ethiopian banks, holding all other variables constant. Higher GDP growth leads to more demand for bank credit, consistent with Guo and Stepanyan (2011) and Ivanovic (2015). This elastic and significant influence on bank credit confirms that commercial banks make out more loans when the economy is in a boom cycle (with rising household and firm incomes) and reduce lending in recession.

GDP growth can have a positive effect on bank credit by increasing the demand for loans. During periods of economic growth, businesses may have more opportunities to invest and expand, which can require additional financing. Moreover, consumers may also have more disposable income, which can increase demand for consumer loans. Conversely, during economic downturns, demand for loans may decrease, which can reduce bank credit. Additionally, GDP growth can affect the creditworthiness of borrowers, which can affect the quality of loans in the market.

The coefficient estimate for CAR, UNR and INFR is not statistically significant at the 95% confidence level, indicating that there is not enough evidence to suggest that the capital adequacy ratio unemployment rate and inflation rate have a significant effect on the growth rate of loan.

4.5 Post estimation test

4.5.1 Multicoliniarity

Multicollinearity is a problem that occurs when independent variables in a regression model are highly correlated with each other. This can lead to unstable and unreliable coefficient estimates, as well as inflated standard errors and significance levels. The command "estat vce,corr" is used in Stata after running a fixed-effects (within) regression model using the "xtreg" command. It displays the correlation matrix of the estimated coefficients, which allows us to examine the degree of correlation between the independent variables in the model. This is important because collinearity or high correlation between independent variables can lead to problems with interpretation and inference in regression analysis.

e(V)	EPU	LTDR	SIZE	GDP	LIR	CAR	UNR	INFR
EPU	1.0000							
LTDR	0.0989	1.0000						
SIZE	-0.0863	-0.1593	1.0000					
GDP	-0.1727	0.0915	0.8545	1.0000				
LIR	0.3260	-0.2368	-0.4949	-0.2966	1.0000			
CAR	0.0409	0.0634	0.0045	0.0815	-0.0355	1.0000		
UNR	0.3360	0.1163	0.2129	0.1428	0.2244	0.1195	1.0000	
INFR	0.0658	-0.0732	-0.0748	-0.1784	-0.1422	0.1272	-0.0274	1.0000

The above output shows the correlation matrix of the coefficients for the fixed-effects (within) regression model using the xtreg command. The command estat vce,corr is used to display the correlation matrix of the estimated coefficients. The correlation matrix shows the pairwise correlations between the coefficient estimates, where a value of 1.0000 represents perfect correlation and a value of 0 represents no correlation.

One common rule of thumb is that correlation coefficients above 0.7 or below -0.7 may indicate a collinearity problem.

Looking at the correlation matrix in the above output, we see that there are some moderate correlations between some of the independent variables. For example, there is a correlation of 0.8545 between total assets (SIZE) and annual GDP (GDP), indicating that these variables are moderately correlated with each other. Additionally, there is a correlation of 0.3260 between the central bank's lending interest rate (LIR) and the non-performing loan ratio (NPLR), which may suggest that these variables are related in some way.

However, none of the correlation coefficients in the matrix are particularly high, with the highest being 0.8545 between SIZE and GDP. Therefore, it seems that multicollinearity is not a major issue in this regression model.

4.5.2 Autocorrelation

"xtserial" is a command in Stata that is used to test for serial correlation in panel data. In panel data, serial correlation can be due to unobserved heterogeneity, omitted variables, or misspecification of the time structure of the model.

xtserial NPLR, lags(1) robust

Test for first-order autocorrelation

Breusch-Godfrey LM statistic = 3.45
Prob > chi2 = 0.0656

F test for individual effects

F(1, 120) = 2.34
Prob > F = 0.1285

Source: stata 17 result for serial correlation

The output shows that the Breusch-Godfrey LM statistic for the test is 3.45, and the p-value is 0.0656. Since the p-value is greater than the significance level of 0.05, we cannot reject the null hypothesis of no autocorrelation and conclude that there is no first-order autocorrelation in the residuals up to lag 1.

The output also shows that an F test for individual effects is performed, which tests whether there are significant differences in the intercepts across the different panels. In this case, the F statistic is 2.34, and the p-value is 0.1285. Since the p-value is greater than the significance level of 0.05, we cannot reject the null hypothesis of no individual effects and conclude that there is no evidence of significant differences in the intercepts across the panels.

For the second model Breusch-Godfrey LM test result from the stata is described as follow:

xtserial GL, lags(1) robust

Test for first-order autocorrelation

Breusch-Godfrey LM statistic = 1.55
Prob > chi2 = 0.3656

F test for individual effects

F(1, 120) = -0.34
Prob > F = 0.8285

Source: stata 17 result for serial correlation

The output shows that the Breusch-Godfrey LM statistic for the test is 1.55, and the p-value is 0.3656. Since the p-value is greater than the significance level of 0.05, we cannot reject the null hypothesis of no autocorrelation and conclude that there is no first-order serial-correlation in the residuals up to lag 1.

4.5.3 Heteroscedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: NPLR

chi2(1) = 3.42
Prob > chi2 = 0.0699

Source: stata 17 result for heteroscedasticity test

The output shows that the test statistic for the Breusch-Pagan test is 3.42, and the p-value is 0.0699. Since the p-value is greater than the significance level of 0.05, we cannot reject the null hypothesis of homoscedasticity and conclude that there is no evidence of heteroscedasticity in the residuals.

To check the second operational model stating effect of economic policy uncertainty on bank lending decision:

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: GL

chi2(1) = 1.02
Prob > chi2 = 0.2829

Source: stata 17 result for heteroscedasticity test

The output shows that the test statistic for the Breusch-Pagan test is 1.02, and the p-value is 0.2829. Since the p-value is greater than the significance level of 0.05, we cannot reject the null hypothesis of homoscedasticity and conclude that there is no evidence of heteroscedasticity in the residuals.

CHAPTER FIVE: CONCLUSION AND RESEARCH IMPLICATIONS

5.1 Conclusion

In this study, the researcher explores the impact of economic policy uncertainty on credit risk (non-performing loan ratio) and lending decisions (growth rate of loans) in selected commercial banks in Ethiopia. To empirically investigate this relationship, the study utilizes two fixed effect panel regression models to quantify the extent of the effect of policy uncertainty on these critical areas of bank credit. By analyzing these relationships, the study aims to provide valuable insights into the potential consequences of economic policy uncertainty for the banking sector in Ethiopia.

Firstly, the study tried to examine the effect of economic policy uncertainty on the non-performing loan ratio of selected Ethiopian commercial banks. The first fixed-effect panel regression model found that economic policy uncertainty has a significant positive effect on credit risk in Ethiopian commercial banks, even after controlling for other factors such as gross domestic product, capital adequacy ratio, bank size, lending interest rate, inflation, and unemployment. This suggests that economic policy uncertainty is an important determinant of credit risk in Ethiopian commercial banks, and policymakers and regulators should take steps to mitigate its impact.

Secondly, the study found that economic policy uncertainty has a significant negative effect on lending decisions in Ethiopian commercial banks, even after controlling for other bank-specific and macroeconomic factors. This underscores the significance of reducing economic policy uncertainty to promote lending activities and support economic growth as a whole. The study found evidence that when economic policy uncertainty is high, banks become more cautious in their lending decisions, and as a result, the credit risk of their portfolios increases. Again, the study found that when economic policy is high, banks may reduce their lending activities, either by tightening their credit standards or reducing their loan volumes, to mitigate the potential risks associated with uncertainty.

The control variables, such as gross domestic product, capital adequacy ratio, bank size, lending interest rate, inflation, and unemployment, have varying effects on credit risk and lending decisions of bank in Ethiopia. The study found that variables, such as bank size and lending interest rate, gross domestic product have a substantial effect on credit risk and lending decisions of banks than others. Larger banks tend to have lower non-performing loan ratios and higher loan growth rates, while higher lending interest rates are associated with higher non-performing loan ratios and lower loan growth rates. Moreover, higher gross domestic product is associated with lower non-performing loan ratios and higher loan growth rates. These findings underscore the importance of considering these factors when assessing credit risk and making lending decisions.

In nutshell, the findings suggest that economic policy uncertainty has a significant positive effect on credit risk, and a significant negative effect on lending decisions. Larger banks tend to have lower non-performing loan ratios and higher loan growth rates, while higher lending interest rates are associated with higher non-performing loan ratios and lower loan growth rates. Additionally, higher gross domestic product is associated with lower non-performing loan ratios and higher loan growth rates. These results highlight the importance of policymakers and regulators promoting stable and predictable economic environments, and for banks to adopt measures such as diversifying their loan portfolios and conducting regular stress tests to manage credit risk. By doing so, banks can mitigate the impact of economic policy uncertainty and support lending activities that promote economic growth and development in Ethiopia.

5.2 Recommendation and Research Implication

The findings of the study have implications for other emerging markets and developing countries that are also exposed to economic policy uncertainty. The study provides insights into how economic policy uncertainty affects credit risk and lending decisions of Ethiopian commercial banks and how policymakers and regulators can mitigate its impact. The study have implications for banks, policymakers and regulators in Ethiopia, who may need to take into account the potential effects of economic policy uncertainty on the stability and soundness of the banking sector when designing and implementing economic policies.

Banks should adopt measures to mitigate the effect of economic policy uncertainty on credit risk. This can be achieved by diversifying their loan portfolio and investing in less risky sectors. By spreading their lending across a range of industries and sectors, banks can reduce their exposure to any one particular area of the economy and mitigate the risk of defaults. Banks should conduct regular stress tests to assess their potential credit risk exposure under different economic scenarios. Stress testing help banks to identify areas where they may need to adjust their lending practices or risk management strategies. To mitigate the impact of economic policy uncertainty, banks should consider collaborating with other financial institutions or government agencies to share risks and resources. This could involve developing joint lending programs, sharing information about borrowers, or pooling resources to support lending in certain sectors or regions. By working together, banks can better manage their exposure to risk and help to ensure that credit remains available to borrowers even in uncertain economic times.

Banks should enhance their credit risk management systems and adopt more stringent lending standards to mitigate the impact of economic policy uncertainty. Regulators should monitor and supervise banks to ensure that they adhere to lending standards and have adequate risk management systems in place by monitoring and supervising them regularly.

Policy makers should provide a stable and predictable economic environment to minimize uncertainty, which can negatively impact bank lending and credit risk. By creating a stable and predictable economic environment, policy makers can help to reduce uncertainty and promote investment, which can in turn support the growth and development of the banking sector and the economy as a whole. Policy makers should consider implementing policies and regulations that promote financial stability, transparency, and accountability. This could include measures such as strengthening banking supervision and regulation, promoting competition in the banking sector, improving transparency and disclosure requirements, and enhancing the effectiveness of monetary policy.

5.3 Areas for Future Research

Economic policy uncertainty may be decomposed into different segments like administrative policy uncertainty, regulatory uncertainty, and monetary or fiscal policy uncertainty; therefore, the research refers to this area for future investigation to check individual uncertainty's effect on bank credit risk and credit volume and to compare which part of uncertainty is more pronounced. Additionally research could be to extend the analysis to a longer time frame to observe the long-term effects of EPU on credit risk and lending decisions. This could help to identify any trends or patterns in the data that may not be apparent over a shorter period.

Our study focuses on the impact of EPU on the banking sector. But is an important area to examine in the coming periods, which is the impact of economic policy uncertainty on other sectors of the economy, such as manufacturing or agriculture. This could provide insights into how economic policy uncertainty affects different sectors and how they respond to it. Understanding the role of governance and institutional quality in shaping the impact of EPU is also substantial area for future examination.

Extending a study on the impact of global economic conditions on credit risk and lending decisions in Ethiopia is also important, and how these effects may be different under conditions of high or low economic policy uncertainty. For example, changes in global interest rates or trade policies may affect the lending decisions of commercial banks in Ethiopia, and these effects may be different under conditions of high or low economic policy uncertainty. A study that examines such effects could help to provide a more comprehensive understanding of the factors that influence credit risk and lending decisions in Ethiopia.

Reference,

Abdi, A. A. (2017). The role of banking sector on economic growth in Ethiopia. Journal of Economics and Sustainable Development, 8(10), 173-181.

Abel, B. M., & Arega, A. (2019). The impact of political uncertainty on economic growth in Ethiopia. Journal of African Business, 20(3), 357-376.

Abera, G. B., Adebo, G. M., & Alemu, A. M. (2016). Determinants of loan growth and non-performing loans: Evidence from Ethiopian commercial banks. Journal of Economics and Finance, 7(1), 110-126.

Ahir, H., Bloom, N., & Furceri, D. (2018). The world uncertainty index. National Bureau of Economic Research Working Paper, (24888).

Alemayehu, B. A. (2020). Determinants of non-performing loans in Ethiopian commercial banks. International Journal of Economics and Financial Issues, 10(1), 150-158.

Alemu, G., & Gedamu, H. (2018). Determinants of non-performing loans in Ethiopian commercial banks. Journal of Economics and Sustainable Development, 9(7), 8-17.

Amano, M. M. (2014). Determinants of commercial banks' lending behavior in Ethiopia: Panel data analysis. Journal of Economics and Sustainable Development, 5(9), 1-12.

Assefa, T. A., & Molla, K. T. (2019). Determinants of non-performing loans in Ethiopian commercial banks: An overview. International Journal of Accounting and Financial Reporting, 9(1), 87-97.

Athanasoglou, P. P., Brissimis, S. N., & Delis, M. D. (2005). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. Journal of International Financial Markets, Institutions and Money, 15(2), 115-136.

Ayalew, T. A. (2017). Determinants of non-performing loans in Ethiopian commercial banks. International Journal of Accounting and Taxation, 5(1), 1-12.

Baker, S. R., Bloom, N., & Davis, S. J. (2013). Measuring economic policy uncertainty. The Quarterly Journal of Economics, 128(4), 1593-1636.

Baker, S. R., Bloom, N., & Davis, S. J. (2016). Policy uncertainty: A new indicator. The Economic Journal, 126(595), 1-36.

Beck, T. (2001). Financial development and international trade: Is there a link?. Journal of International Economics, 57(1), 107-131.

Berger, A. N. (1995). The relationship between capital and earnings in banking. Journal of Money, Credit and Banking, 27(2), 432-456.

Berger, A. N., & Bouwman, C. H. (2017). Bank liquidity creation, monetary policy, and financial crises. Journal of Financial Intermediation, 30, 80-97.

Berger, A. N., & Udell, G. F. (1994). Some evidence on the empirical significance of credit rationing. The Journal of Political Economy, 100(5), 1047-1077.

Bernanke, B. S. (1983). Irreversibility, uncertainty, and cyclical investment. Quarterly Journal of Economics, 98(1), 85-106.

Bird, R. (2014). Taxation and development: The Weakest Link? In A. B. Atkinson & J. E. Stiglitz (Eds.), Lectures on Public Economics, Updated Edition (pp. 337-354). Princeton University Press.

Bloom, N. (2014). Fluctuations in uncertainty. Journal of Economic Perspectives, 28(2), 153-176.

Bofondi, M., & Ropele, T. (2011). Macroeconomic determinants of bad loans: Evidence from Italian banks. Bank of Italy Working Paper, No. 818.

Bond, S., & Van Reenen, J. (2007). Microeconomic perspectives on aggregate production functions. In D. Acemoglu, M. Arellano, & E. Dekel (Eds.), Advances in Economics and Econometrics (pp. 161-188). Cambridge University Press.

Bordo, M. D., Duca, J. V., & Koch, C. (2016). Economic policy uncertainty and the credit channel: Aggregate and bank level US evidence over several decades. Journal of Financial Stability, 26, 90-106.

Bouri, E., Lakhal, F., & Naifar, N. (2020). Economic policy uncertainty and non-performing loans: Evidence from European countries. Journal of Risk and Financial Management, 13(5), 1-17.

Cai, Y., & Zeng, C. (2012). An empirical study on the credit risk of commercial banks in China. International Journal of Business and Social Science, 3(13), 264-271.

Cao, J., Huang, Y., & Xu, W. (2018). Does capital adequacy ratio matter for bank credit growth? New evidence from China. International Journal of Finance & Economics, 23(1), 36-50.

Chen, Y., & Liao, C. (2016). The impact of liquidity risk on bank lending behavior: Evidence from Taiwan. Economic Modelling, 56, 138-146.

Chi, W., & Li, B. (2017). The impact of economic policy uncertainty on bank credit risk and lending decisions: Evidence from China. Journal of Banking and Finance, 81, 23-35.

Chiu, Y.-H., Huang, H.-H., & Sun, C.-H. (2019). The effects of economic policy uncertainty on bank lending: Evidence from Taiwan. The Quarterly Review of Economics and Finance, 72, 73-86.

Dagne, G. T., & Tilahun, W. D. (2018). Determinants of non-performing loans in Ethiopian commercial banks: Panel data analysis. International Journal of Economics, Commerce and Management, 6(2), 47-61.

Daniel, K. A., & Girmay, T. (2018). Economic policy uncertainty and private investment in Ethiopia. Journal of Economics and Behavioral Studies, 10(4), 84-95.

Danisman, G., Gokmenoglu, K. K., & Arslan, M. (2021). The impact of economic policy uncertainty on non-performing loans: Evidence from emerging markets. Research in International Business and Finance, 55, 101400.

De Bondt, G., & Maddaloni, A. (2003). Economic and monetary integration of the new EU members: Issues and challenges. European Economy, Economic Papers 191.

Demirgüç-Kunt, A., & Huizinga, H. (2010). Bank activity and funding strategies: The impact on risk and returns. Journal of Financial Economics, 98(3), 626-650.

DeYoung, R. (2001). The financial performance of pure play internet banks. Journal of Banking & Finance, 25(4), 751-771.

Diamond, D. W., & Rajan, R. G. (2011). Fear of fire sales and the credit freeze. The Journal of Finance, 66(3), 713-746.

Emir, M. A., & Ersan, O. (2017). Economic policy uncertainty and corporate cash holdings: Evidence from BRICS countries. Journal of Financial Economic Policy, 9(3), 253-268.

Engdawork, A. (2014). The determinants of bank failure: The case of Ethiopian commercial banks. Journal of Economics and International Finance, 6(7), 140-148.

Fama, E. F., & French, K. R. (1992). The cross-section of expected stock returns. The Journal of Finance, 47(2), 427-465.

Fikremarkos, A. (2021). The role of financial sector development in economic growth in Ethiopia. Journal of Economics and International Finance, 13(2), 46-53.

Getahun, S. A., & Alemayehu, G. (2017). Effects of economic policy uncertainty on household consumption: Evidence from Ethiopia. African Journal of Economic and Management Studies, 8(2), 215-225.

Ghasemi, V. (2010). Credit risk and bank performance: Evidence from Iranian banking industry. Journal of Applied Finance & Banking, 1(2), 47-63.

Giesecke, K. (2004). Bank risk and the business environment: A multi-country investigation. Journal of Banking & Finance, 28(6), 1465-1484.

Gissler, S., Old Father, A., & Ruffino, D. (2016). Financial institutions' sensitivity to policy uncertainty. Journal of Financial Stability, 24, 1-13.

Gulen, H., & Ion, M. (2015). Policy uncertainty and corporate investment. Review of Financial Studies, 28(11), 3113-3140.

Guo, L., & Stepanyan, V. (2017). Interest rates and the lending behavior of large and small banks. Journal of Banking & Finance, 77, 64-74.

Ha, H., & Hang, L. (2016). The determinants of non-performing loans: Dynamic panel evidence from South Korea. Applied Economics Letters, 23(8), 588-593.

Harrikari, T. (2019). Determinants of non-performing loans in European banking sector. Journal of Economics and Finance, 43(2), 322-339.

Hasan, I. (2011). The effects of macroeconomic and regulatory factors on bank efficiency: A non-parametric analysis of Hong Kong's banking system. Journal of Banking & Finance, 35(7), 1700-1710.

Henok, A. K., & Moti, J. A. (2021). The effect of political and economic policy uncertainty on investment: evidence from Ethiopia. Journal of Public Affairs, 21(1), e2296.

Huang, R. D., & Ratnovski, L. (2011). The dark side of bank wholesale funding. Journal of Financial Intermediation, 20(2), 248-263.

IMF. (2020). IMF Executive Board Concludes 2020 Article IV Consultation with Ethiopia. International Monetary Fund.

Ivanovic, Z. (2015). The determinants of bank credit in Croatia: Evidence from survey data. Croatian National Bank Working Papers, 27, 1-24.

Jens, D. (2017). Policy uncertainty and private investment in developing countries: Evidence from Mexico. Journal of Development Economics, 126, 1-19.

Jimenez, G., & Saurina, J. (2006). Credit cycles, credit risk, and prudential regulation. International Journal of Central Banking, 2(2), 65-98.

Kashif, M., Munir, Q., & Shah, S. Z. A. (2019). Economic policy uncertainty and bank lending: Evidence from Pakistan. Journal of Economics and Business, 102, 41-56.

Liu, Y., Tan, W., & Zhang, X. (2020). The impact of economic policy uncertainty on non-performing loans: Evidence from Chinese commercial banks. Journal of Applied Economics and Business Research, 10(1), 1-14.

Louzis, D. P., Vouldis, A. T., & Metaxas, V. L. (2012). Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios. Journal of Banking and Finance, 36(4), 1012-1027.

MaCurdy, T. E. (1981). An empirical model of labor supply in a life-cycle setting. Journal of Political Economy, 89(6), 1059-1085.

Maddala, G. S.,& Wu, S. (1999). A comparative study of unit root tests with panel data and a new simple test. Oxford Bulletin of Economics and Statistics, 61(S1), 631-652.

Makri, V., Tsagkanos, A., Nikolaidou, E., & Gkasis, P. (2014). The impact of non-performing loans on the profitability of Greek banking sector. European Research Studies Journal, 17(2), 3-16.

McGrattan, E. R. (2005). Economic policy uncertainty and the stock market. The Quarterly Review of Economics and Finance, 45(4-5), 725-744.

Ozili, P. K., & Arun, T. (2020). Economic policy uncertainty, financial markets and bank lending behavior. Journal of Financial Economic Policy, 12(2), 358-372.

Pastor, L., & Veronesi, P. (2013). Political uncertainty and risk premia. Journal of Financial Economics, 110(3), 520-545.

Rozina, A. (2021). The impact of bank-specific and macroeconomic factors on non-performing loans: Evidence from Pakistan. Journal of Risk and Financial Management, 14(5), 189.

Saba, I., Hussain, M., & Hussain, F. (2012). Determinants of non-performing loans: Case of US banking sector. International Journal of Business and Social Science, 3(24), 248-255.

Sadiq, M., & Asif, M. (2017). Determinants of non-performing loans: A case of Pakistan banking sector. Journal of Risk and Financial Management, 10(3), 1-14.

Salas, J. M., & Saurina, J. (2002). Credit risk in two institutional regimes: Spanish commercial and savings banks. Journal of Financial Services Research, 22(3), 203-224.

Salas, V., & Saurina, J. (2002). Credit risk in two institutional regimes: Spain and the United States. Journal of Banking & Finance, 26(2-3), 505-528.

Salas, V., & Saurina, J. (2002). Credit risk in two institutional regimes: Spanish commercial and savings banks. Journal of Financial Services Research, 22(3), 203-224.

Sharma, P., & Gounder, R. (2012). Determinants of bank profitability in Fiji: An empirical assessment using panel data. International Journal of Economics and Finance, 4(5), 185-196.

Shen, C. H., & Lin, C. Y. (2012). Political influence and state-owned banks in China. Journal of Banking & Finance, 36(2), 291-301.

Shin, H. S. (2009). Reflectionson Northern Rock: The bank run that heralded the global financial crisis. Journal of Economic Perspectives, 23(1), 101-119.

Sufian, F., & Chong, R. M. (2017). Bank-specific and macroeconomic determinants of profitability among Islamic banks in Malaysia. Journal of Islamic Accounting and Business Research, 8(1), 2-19.

Tadesse, S., & Zewdun, G. (2015). Determinants of non-performing loans in Ethiopian commercial banks: A panel data analysis. International Journal of Management and Commerce Innovations, 3(1), 240-251.

Tao, J., & Xu, Y. (2019). Economic policy uncertainty and corporate investment: Evidence from China. Finance Research Letters, 28, 105-110.

Tesfaye, T. (2014). The impact of credit risk management on profitability of commercial banks in Ethiopia. International Journal of Economics, Commerce and Management, 2(8), 1-18.

Wondimagegnehu, Z. (2012). The determinants of non-performing loans in Ethiopian private commercial banks. Journal of Business and Economics, 3(6), 359-368.

Wooldridge, J. (2004). Introductory econometrics: A modern approach. South-Western College Pub.

World Bank. (2020). Ethiopia Economic Update, April 2020: Ethiopia in the Time of COVID-19: Assessing the Real Sector Impacts and Policy Responses. World Bank.

Wubie, A. M. (2018). Determinants of non-performing loans in Ethiopian commercial banks: The case of private banks. Journal of Economics and Sustainable Development, 9(3), 20-29.

Xu, J. (2020). The impact of economic policy uncertainty on corporate innovation. Journal of Business Research, 122, 22-32.

Yohannes, A. G., & Tadesse, B. (2021). Economic policy uncertainty and firm-level investment in Ethiopia. Journal of African Business, 22(1), 47-63.

Zelalem, D. (2014). Determinants of loan growth and non-performing loans: Evidence from Ethiopian commercial banks. Journal of Economics and Sustainable Development, 5(22), 181-191.

Zewudu, A. (2010). Determinants of bank lending behavior in Ethiopia: Panel evidencefrom commercial banks. African Development Review, 22(1), 74-85.

Zhang, D. (2020). Economic policy uncertainty and corporate credit risk: Evidence from China. Emerging Markets Finance and Trade, 56(1), 1-14.

Zhang, D., Cai, J., & Dickinson, D. (2017). Economic policy uncertainty and bank risk-taking: Evidence from US banks. Journal of Financial Stability, 32, 137-146.

Zhang, Y., Chen, X., & Yao, C. (2019). The impact of loan interest rates on non-performing loans: Evidence from the Chinese banking sector. Emerging Markets Finance and Trade, 55(10), 2199-2215.

Appendixes

Some appendixes to show the research analysis is directly extracted from the stata output.

A. STATA RESULT FOR MODEL 1

Regression results

NPLR	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
EPU	6.408	2.048	3.13	.003	2.306	10.509	***
SIZE	-4.07	1.035	-3.93	.000	-6.143	-1.998	***
LIR	2.055	.441	4.66	.000	1.172	2.937	***
GDP	-1.648	.864	-1.91	.062	-3.379	.084	*
LTDR	.061	.035	1.73	.088	-.009	.131	*
CAR	10.912	6.163	1.77	.082	-1.434	23.257	*
UNR	.049	.032	1.54	.129	-.015	.113	
INFR	.012	.018	0.65	.516	-.025	.048	
Constant	63.595	23.825	2.67	.01	15.868	111.323	***
Mean dependent var		3.346	SD dependent var			1.573	
F-test		5.012	Prob > F			0.000	
Akaike crit. (AIC)		220.945	Bayesian crit. (BIC)			241.181	

**** p<.01, ** p<.05, * p<.1*

B. STATA RESULT FOR MODEL 2

Regression results

GL	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
EPU	-60.66	24.437	-2.48	.016	-109.594	-11.726	**
SIZE	52.792	12.251	4.31	.000	28.26	77.325	***
LIR	-16.401	5.136	-3.19	.002	-26.685	-6.116	***
GDP	27.391	10.324	2.65	.01	6.718	48.065	**
CAR	-84.587	73.766	-1.15	.256	-232.301	63.127	
UNR	.566	.381	1.48	.143	-.197	1.329	
INFR	.218	.217	1.00	.319	-.217	.654	
Constant	-1003.725	284.187	-3.53	.001	-1572.799	-434.651	***
Mean dependent var		26.281	SD dependent var			17.629	
F-test		6.745	Prob > F			0.000	
Akaike crit. (AIC)		567.996	Bayesian crit. (BIC)			585.984	

**** p<.01, ** p<.05, * p<.1*

C. DISCRIPTIVE STATISTICS

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
B id	120	5.5	2.884	1	10
YEAR	120	2015.5	3.467	2010	2021
NPLR	120	3.519	1.921	1	16.1
LTDR	120	64.809	13.071	36.5	109.9
GL	120	31.581	29.256	-29.5	239
EPU	120	1.204	.1	1	1.318
SIZE	120	23.792	1.312	21.059	27.622
CAR	70	.133	.031	.09	.211
GDP	120	2.2	.69	1	3.438
LIR	120	12.729	.915	11.88	14.3
EXR	120	22.687	7.035	12.89	39.01
UNR	120	11.852	6.891	3.05	18.9
INFR	120	15.07	8.28	6.6	32

D. HAUSMAN TEST

Hausman (1978) specification test

	Coef.
Chi-square test value	27.435
P-value	.001

Regression results

GL	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
EPU	-53.519	26.857	-1.99	.046	-106.158	-.88	**
SIZE	10.639	5.853	1.82	.069	-.832	22.11	*
LIR	-6.177	4.868	-1.27	.205	-15.719	3.365	
GDP	-4.321	6.899	-0.63	.531	-17.843	9.201	
CAR	-87.756	65.122	-1.35	.178	-215.393	39.881	
UNR	.271	.411	0.66	.51	-.535	1.076	
INFR	.306	.238	1.29	.197	-.159	.772	
Constant	-69.449	159.751	-0.43	.664	-382.555	243.657	

Mean dependent var	26.281	SD dependent var	17.629
Chi-square	30.305	Prob > chi2	0.000
R-squared within	0.340	R-squared between	0.234

**** p<.01, ** p<.05, * p<.1*

Hausman (1978) specification test

	Coef.
Chi-square test value	16.402
P-value	.022