Does Bank Lending Channel Exist in Kenya: Bank Level Panel Data Analysis

By

Moses Muse Sichei
Research Department
Central Bank of Kenya

and

Githinji Njenga
Kenya Institute for Public Policy and Analysis
(KIPPRA)

AERC Research Paper 249
African Economic Research Consortium, Nairobi
August 2012

THIS RESEARCH STUDY was supported by a grant from the African Economic Research Consortium. The findings, opinions and recommendations are those of the author, however, and do not necessarily reflect the views of the Consortium, its individual members or the AERC Secretariat.

Published by: The African Economic Research Consortium
P.O. Box 62882 – City Square
Nairobi 00200, Kenya

Printed by: Modern Lithographic (K) Ltd
P.O. Box 52810 – City Square
Nairobi 00200, Kenya

ISBN 978-9966-023-26-1

Contents

List of tables

Abstract

The study empirically investigates bank lending channel (BLC) of monetary policy transmission in Kenya using annual bank-level panel data during the period 2001-2008. A modified IS/LM model with bank lending is used in the spirit of Bernanke and Blinder (1988), and banks are segregated on the basis of asset size, capital adequacy, liquidity and foreign ownership criteria. The main finding is that BLC exists in Kenya based on bank liquidity and capitalization. In particular, banks with less liquid balance sheets and low total capital to risk-weighted asset ratios are hit most by monetary policy. Since low liquidity and low capital banks are generally large banks, which contribute 82% of total bank credit, BLC is significant in Kenya. The existence of BLC means that monetary policy has asymmetric effects on banks and borrowers in Kenya. Further, bank credit can be used as a nominal anchor for monetary policy and a leading indicator for economic activity in Kenya.

Acknowledgements

This research work has benefited immensely from several people and institutions. First, financial support from the African Economic Research Consortium (AERC) is gratefully acknowledged. Second, we thank our respective institutions of affiliation (CBK and KIPPRA) for their institutional support. Third, very helpful comments from the resource persons and other workshop participants in AERC's thematic group C are appreciated. Fourth, we thank Badi Baltagi for useful suggestions on the simultaneous equations panel econometrics methodology. Finally, we also thank the African division of the IMF Institute (Washington DC) for the support, encouragement, discussions and helpful comments when the paper was presented in the internal seminar on the 16th February 2010, while the lead researcher was a visiting scholar at the Institute. The views expressed in this research paper are those of the authors and do not necessarily represent the opinions of CBK and KIPPRA. Any errors are entirely ours.

List of abbreviations and acronyms

BLC	Bank Lending Channel
B2SLS	Between Two Stage Least Squares
CBK	Central Bank of Kenya
DPF	Deposit Protection Fund
EC3SLS	Error Components Three Stage Least Squares
EMU	European Monetary Union
ESAF	Enhanced Structural Adjustment Facility
GDP	Gross Domestic Product
IMF	International Monetary Fund
KIPPRA	Kenya Institute for Public Policy Research and Analysis
MFI	Micro-Finance Institutions
MPAC	Monetary Policy Advisory Committee
MPC	Monetary Policy Committee
MTEF	Medium-Term Expenditure Framework
MTM	Monetary Policy Transmission Mechanism
PRGF	Poverty Reduction and Growth Facility
NBFI	Non-Bank Financial Institutions
NSE	Nairobi Stock Exchange
PSI	Policy Support Instrument
Repo	Repurchase Agreement
SAPs	Structural Adjustment Programmes
SME	Small and Medium-sized Enterprises
UIP	Uncovered Interest Parity
UK	United Kingdom
USA	United States of America
VAR	Vector Autoregression
W2SLS	Within Two Stage Least Squares

1. Introduction

Standard macroeconomic theory suggests that monetary policy has little impact on the growth of real output in the long-run (Walsch, 2010). Real sector variables such as skills and technology determine the long-run steady state output (HM Treasury, 2003). However, over the short-term, horizon monetary policy can significantly influence the course of the real economy (Bernanke and Gertler, 1995). Mishkin (1995), Bernanke and Gertler (1995), among others, describe various channels through which monetary policy actions impact real variables such as output and employment for a modern industrial economy. These transmission mechanisms include interest rate effects (interest rate channel or money channel), the credit channel (balance-sheet and bank-lending channels BLC), exchange rate effects (exchange rate channel), and other asset (equity and real estate) price channels.

Mishkin (1995) points out that the interest rate channel of monetary policy transmission is the basic Keynesian textbook model that has been in the economics literature for over 50 years. According to this channel, changes in nominal money stock or the short-term nominal policy interest rate[1] are transmitted to real interest rates, which in turn alter the marginal cost of borrowing, leading to changes in investment decisions, including housing and consumer durable expenditure.

Bernanke and Gertler (1995) point out that dissatisfaction with the interest rate channel (money view) led to the credit channel of the monetary policy transmission, which emphasizes how asymmetric information and costly enforcement of contracts create agency problems in financial markets. Two basic channels of monetary policy transmission mechanisms (MTM) exist as a result of agency problems in the credit market: the bank lending channel (narrow credit channel), and the balance sheet channel (broad credit channel). Mishkin (1995) argues that the bank lending channel (BLC) is predicated on the view that banks play a unique role in the financial system because they are well suited to deal with certain types of borrowers, especially small firms, where the problem of asymmetric information is significant. Large firms can directly access credit markets through the stock and bond markets with ease. Consequently, a contractionary monetary policy that decreases bank reserves and deposits will have an impact on the real economy through its effect on lending to small borrowers. There has been doubt in the literature about the importance of BLC, due to financial innovations that have reduced the role of banks in the credit market (Edwards and Mishkin, 1995).

According to the balance sheet channel (broad credit channel), a monetary policy-induced lower net worth of firms and individuals raises the adverse selection problem, and thus leads to decreased lending for finance investment spending. A lower net worth

of business firms may also increase the moral hazard problem, since owners have a lower equity stake in the firms, giving them an incentive to engage in risky investments. Monetary policy can affect firms' balance sheets through changes in equity prices, cash flow and liquidity effect. Testing this channel requires firm-level data.

With an open economy since 1995, the monetary policy in Kenya can operate to a considerable extent through the exchange rate channel. A key assumption underpinning the relationship is the Uncovered Interest Parity (UIP): with a floating exchange rate, a policy-induced cut in domestic interest rates leads to capital outflow and depreciation of the nominal exchange rate and a shift to foreign-denominated assets. With sticky prices, the changes will lead to a real depreciation and an increase in the price of tradeables relative to non-tradeables. This channel is potentially strong due to the large influence of exchange rate on demand for a small open economy such as Kenya's.

The other asset prices channel focuses on the universe of relative asset prices and real wealth. This channel involves the Tobin's q theory of investment and wealth effects on consumption. Monetary policy-induced reduction in equity prices will lead to lower q and thus to lower investment spending. An alternative channel through the equity prices occurs through the effects of effects on consumption.

As pointed out by Mishkin (1995) and Bernanke and Gertler (1995), the credit channel, exchange rate channel, and other asset price channels amplify the effects of the interest channel and are not substitutes. Additionally, these channels depend on the institutional structure of an economy. The expectations also play a critical role in the MTM. There are two critical challenges in identifying monetary policy transmission mechanisms in a developing country such as Kenya. First, the financial and capital markets, which are essential for the effectiveness of the interest rate channel of MTM, are narrow, shallow and imperfect. Second, most of the potential indicators of monetary policy stance are endogenously determined by various internal and external shocks. Important aspects here are the changes in the policy regimes that partially or fully endogenize monetary policy in different times and the lingering effects of a change in a regime. Finally, there is lack of quality data useful for identifying MTM.

This study aims to assess the existence of BLC for a number of reasons. First, the financial and capital markets are imperfect, making it difficult to transmit monetary policy stimuli through the interest rate channel. Additionally, the legal and institutional structure for enforcement of debt contracts is weak, making bank loan supply collateral-centred, with lending rates that are sticky downwards. Second, bank loans are the main source of finance in Kenya. Non-bank financial intermediaries, building societies and micro-finance institutions contribute a small proportion of the lending in Kenya. Finally, the existence of BLC implies that the effects of monetary policy are asymmetric.

The novelty of our research is threefold. First, we attempt to provide baseline results on the existence of BLC in Kenya, given the stage of financial and capital market development and structure of bank portfolio. The study essentially establishes some baseline results on the existence of BLC in Kenya. Second, we attempt to uncover BLC through the use of a simultaneous equations panel data with variables in levels. For this purpose, we resort to the use of panel data unit roots and panel cointegration. The bulk of most relevant literature has tried to uncover BLC through estimation of a reduced form equation of bank credit, with variables in first differences.

Research problem and justification

The critical issue in this study is to disentangle loan supply effects from loan demand effects. This is predicated on the fact that monetary contraction could be followed by a decline in aggregate bank lending due to a decline in loan demand (interest rate channel), and not supply as suggested by the BLC (Kashyap and Stein, 2000).

Thus, the main research question is: does a bank lending channel exist in Kenya? There are very few studies on this area focusing specifically on Kenya to inform monetary policy formulation and implementation. For example, Cheng (2006) studied monetary policy transmission mechanism in Kenya using a vector autoregression (VAR) model but did not focus specifically on the BLC in Kenya.

This study thus fills this knowledge gap. Evidence of BLC has major implications for the conduct of monetary policy (Kashyap and Stein, 1994 and Cecchetti, 1995). First, if the BLC works, monetary policy can affect the real economy without much variation in the interest rate. Second, if the BLC works in Kenya, the effect of monetary policy on banking institutions, and thus their borrowers, is asymmetric. Finally, if the BLC exists, bank credit may be a more reliable indicator of monetary policy effects than monetary aggregates.

Objectives of the study

The broad objective of the study is to assess whether the BLC of monetary policy transmission exists in Kenya or not, given the structure of the financial sector and banking sector portfolio. The specific aspects to be addressed are to:

a) Describe the portfolio structure of banks in Kenya during the period 2001 to 2008.
b) Investigate the existence of BLC using asymmetric behaviour of banks across bank size, liquidity ratio, total capital to risk-weighted assets and foreign ownership.
c) Ascertain whether the BLC is significant in Kenya or not.

Plan of the study

The rest of the paper is organized as follows. Section 2 presents an overview of monetary policy and banking sector developments in Kenya, with an emphasis on the period 2000 to 2008. Section 3 presents a review of the relevant literature and theoretical framework. The methodology is discussed in section 4, while section 5 presents the empirical results and discussion. Section 6 presents the conclusions and policy recommendations.

2. Background

Macroeconomic environment

Kenya's macroeconomic experience can be divided into nine distinct phases: the formative years covering the period 1966 to 1970; the period 1971 and 1975 when internal and external imbalance problems began to emerge following the first oil crisis; the period between 1976 and 1977 when the external situation improved markedly due to substantial improvements in the terms of trade following the coffee boom; the period between 1978 and 1984 when the government budget and the overall balance of payments recorded huge deficits coupled with slow growth in national output; the period between 1984 and 1992 when the government undertook some reforms under the structural adjustment programmes (SAPS) in agriculture, industry, the financial sector, trade and balance of payments in order to strengthen the country's economic base; the period 1993 to 1996 when the government undertook comprehensive structural reforms that culminated in a system where indirect instruments for monetary policy in a market-driven monetary system were used; the slump period (1997-2002); the economic recovery period (2003-2007) and the post-election violence period (2008). The review focuses on the period 2001 to 2008.

The period 1997 to 2002 witnessed major macroeconomic shocks such as suspension of the Enhanced Structural Adjustment Facility (ESAF) by the International Monetary Fund (IMF) in 1997; El-Nino rains in 1998; drought in 2000; signing of the Poverty Reduction and Growth Facility (PRGF) with the IMF in 2001; uncertainties surrounding year 2002 general elections; and introduction of the Medium Term Expenditure Framework (MTEF) in 2000/2001 with a view to linking the annual budgets with long-term development objectives. These shocks had effects on real GDP, inflation, the interest rate and the exchange rate (Table 1).

During 2003 to 2007, the economy began to recover due to ambitious economic reform programmes by the new government, and resumption of donor funding. Real GDP growth rose from 0.5% in 2002 to 7% in 2007. Interest rates were low but inflation pressures persisted due to high government expenditure to fund economic recovery programmes. The economic growth momentum was reversed in 2008 due to the effects of the post-election violence, global recession, unfavourable weather conditions, high costs of production and high international crude oil prices. Economic growth decelerated to 1.7% in 2008 compared to 7% in 2007. Although monetary policy remained focused on maintaining price stability, inflation soared to 26.2% in 2008 from 9.8% in 2007 (Table 1).

Table 1: Selected macroeconomic and financial sector indicators for the period 1994-2008

Indicator	1994	1996	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Growth in real GDP	4.5	3.5	3.4	2.1	0.5	4.5	0.5	2.9	5.1	5.8	6.3	7.0	1.7
Overall inflation rate (%)	22.5	8.9	6.5	5.7	9.9	5.8	2.0	9.8	11.6	10.3	14.5	9.8	26.2
Treasury bill rate (%)	16.1	22.3	15.6	19.0	12.8	11.3	8.4	1.4	8.3	8.1	5.8	6.9	8.6
Repo rate (%)				16.6	12.3	11.1	8.1	0.8	8.9	7.7	6.3	6.6	6.2
Lending rates (%)	25.9	28.6	26.1	25.2	19.6	19.5	18.3	13.5	12.3	13.2	13.7	13.3	14.9
Private sector credit by commercial banks (Ksh billion)	87.4	159.5	224.2	251.6	262.4	255.3	271.5	287.5	353.9	385.2	433.3	503.1	630.8
Reserve money (Ksh billion)	55.3	76.9	75.0	78.9	77.7	79.1	88.5	87.5	101.1	107.2	124.7	156.9	163.6
% bank assets/GDP ratio	0.5	0.6	0.6	0.6	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.6
Non-performing loans (% of total loans)			31.0	34.0	33.1	30.1	30.0	26.0	21.0	18.2	14.9	8.1	7.3
Banks excess liquid assets as % of deposits			18.4	19.8	22.6	25.5	23.9	29.2	22.3	22.3	24.9	21.0	18.2
Exchange rate (Ksh/$)	43.7	55.5	60.4	74.8	78.9	78.9	79.5	76.8	80.7	72.4	69.4	67.6	69.6
Budget deficit (% of GDP)	-6.1	-0.2	-1.3	0.4	0.8	-1.7	-2.2	-2.5	-1.5	0.4	-2.4	-1.2	-3.7
Foreign exchange reserves (Ksh billion)	19.6	46.9	41.4	50.6	61.7	78.5	76.4	106.3	111.2	126.5	163.8	225.8	221.5
Herfindal index					848	897	919	803	857	784	743	716	733

Monetary formulation and implementation in Kenya

Conventional monetary policy did not exist in Kenya until May 1966 when the Central Bank of Kenya (CBK) was established. Monetary policy has been formulated as part of the country's long-term development objectives, policies and plans. For convenience purposes, the history of monetary policy in Kenya can be divided into four phases (Table 2).

Table 2: Phases of monetary policy in Kenya

Monetary policy phase	Description
Passive monetary policy phase (1966-1970)	Monetary policy framework: Monetary policy was aimed at laying basic infrastructure for monetary policy and supporting government development agenda Policy instruments: Direct instruments
Active monetary policy phase with direct policy instruments (1971-1991)	Monetary policy framework: Monetary targeting framework Policy instruments: Direct instruments
Active monetary policy with weak institutions (1992-1996)	Monetary policy framework: Monetary aggregate targeting Policy instruments: Indirect instruments Institutional framework for decision making: CBK internal staff
Active monetary policy using indirect instruments and strong institutions (1997 to present)	Monetary policy framework: Monetary aggregate targeting Policy instruments: Indirect instruments Institutional framework for decision making: From July 2005 (MPAC); From 2008 (executive MPC)

During the first phase (1966-1970), monetary policy was generally passive and CBK's efforts were largely directed towards laying the necessary infrastructure for the effective management of monetary policy, as well as achieving the government's development agenda.

Monetary policy during the second phase (1971-1991) was active but relied mostly on direct instruments of monetary policy: minimum liquid asset ratios imposed on deposit-taking financial institutions (introduced in 1969); minimum cash ratio (introduced in 1971); interest rate controls; and guidelines for an increase in aggregate bank credit as well as minimum agricultural credit ratios.

During the third phase (1992-1996), monetary policy was active and relied mostly on indirect instruments (repurchase agreements, reverse repurchase agreements, rediscount window, overnight lending, flexible exchange rate from 1993, and moral suasion). It was also the phase that witnessed substantial reforms under the SAPs to improve the ability and scope of monetary policy. The Central Bank of Kenya Act was amended in 1996 to enhance its efficiency and effectiveness in monetary policy formulation and implementation.

Monetary policy during the fourth phase (1997 to present) is active and backed by strong institutions and policy instruments. Monetary aggregate targeting framework was used with targets set under the IMF's Poverty Reduction and Growth Facility (PRGF) until 2008 and currently the Policy Support Instrument (PSI). Indirect instruments are used (repos, reverse repos, term auction deposits from 2008, Central Bank Rate from

May 2006 to signal direction of monetary policy, flexible exchange rate from 1993, cash ratio, and moral suasions). The institutional structure for monetary policy making is modern by international standards. From July 2005, monetary policy formulation and implementation was done by CBK internal staff with advice of the Monetary Policy Advisory Committee (MPAC), but from 2008 there has been an executive Monetary Policy Committee (MPC).

Overview of Kenya's Money and Capital Market

Kenya has basic infrastructure for vibrant money and capital markets. These markets play an important role in the MTMs.

There is an active market for government securities covering both Treasury bills and Treasury bonds. Prior to 2000, Treasury bills constituted the highest proportion of the domestic debt, but they have since declined as the government embarked on a policy to lengthen the maturity profile of its debt instruments. The bulk of the Treasury bills are held by commercial banks. There is no secondary market for Treasury bills, but these can be rediscounted at the CBK. There is a secondary market for the Treasury bonds, which can be traded at the Nairobi Stock Exchange (NSE).

The inter-bank market in Kenya is active, and provides an avenue through which commercial banks and non-bank financial institutions (NBFIs) in cash-deficit positions can borrow overnight without collateral from their counterparts with surplus cash. However, the inter-bank market is segmented between large and small banks. Each segment has credit lines for their peers, but a few banks trade across peers. In late 2008, CBK launched a horizontal repurchase agreement (repo) instrument to provide collateralized lending by banks so as to redistribute liquidity efficiently.

There is a primary market for commercial paper and corporate bonds issued by large firms with high credit ratings. These papers provide such firms with short-term funds that are less expensive than bank loans, thus limiting the BLC. There is also a secondary market for corporate bonds at the NSE, priced at a premium to the 91-Day Treasury bill rate. However, these papers have not penetrated the medium and small enterprises to any perceptible extent.

There is also a primary and secondary market for equity shares at the NSE, which was set up in 1954. Trading in equity shares is the dominant activity at the NSE, and shares are used as collateral by many borrowers. The NSE is regulated by the Capital Markets Authority.

However, despite all these, there is still considerable scope for broadening and deepening the capital and financial markets in Kenya, particularly the secondary segments.

Structure of the banking system

Kenya's banking sector is dominated by banks. The other institutions are the non-bank financial institutions (NBFIs), mortgage finance companies and building societies (Table 3).

Table 3: Structure of the banking system in Kenya

Measure	2001	2002	2003	2004	2005	2006	2007	2008
Private local-owned banks	30	30	30	31	38	34	29	28
Local private NBFIs	1	1	3	2	1	1	1	0
Local private building societies	4	4	4	4	1	1	0	0
Local private mortgage companies	2	2	2	2	2	2	2	2
Public-owned banks	5	5	3	3	3	3	3	3
Public-owned NBFIs	3	2	0	0	0	0	0	0
Foreign local incorporated banks	4	6	6	6	6	6	6	8
Foreign branches of banks	7	4	4	4	5	5	5	4

The banking institutions include foreign-owned banks (more than 50% foreign ownership). There is also government shareholding in banks and NBFIs (Table 3). However, government shareholding has declined following the privatization of initiatives in government-owned institutions. Following the adoption of the universal banking policy in 1998, most mortgage companies, NBFIs and building societies have converted to or merged with parent banks. A deposit insurance scheme administered by the Deposit Protection Fund (DPF) board was established in 1986. Membership is compulsory for all institutions that carry out the banking business in Kenya. Member institutions pay annual subscription fees equal to 0.15% of the average deposits held over a period of 12 months or Ksh300,000 (US$3,846), whichever is higher. All types of deposits are insured to a maximum of Ksh100,000 (US$1,282) per depositor.

The level of competition within the banking industry is an important factor influencing monetary policy transmission. Historically, the banking industry in Kenya exhibits an oligopolistic market structure, implying lack of competition as large banks dominate the loans and deposit markets. However, by international standards, the banking sector in Kenya is characterized by low concentration in the period 2000 to 2008. The Herfindahl -Hirsch index (HHI)[2] for net total assets of banks in Kenya is below the critical value of 1,800, indicating that the banking sector in Kenya is unconcentrated (competitive market) during the period 2000 to 2008. The degree of competition has increased as evidenced by the declining HHI index over the period 2003 to 2008.

Bank credit in private sector financing

The private sector claims about 80% of credit from both commercial banks and NBFIs (Table 4). The banking sector contributes more than 95% of the total credit extended by the banking system (Table 4). The continued decline of the contribution of the NBFIs is attributed to the merging with parent banks.

The high contribution of the banking sector increases the potency of the BLC in Kenya. The credit is extended to finance a wide range of private sector activities indicated in column 1 of Table A4 in the appendix. Financing of manufacturing, wholesale and retail trade and business services have been the most dominant lending activities for small, medium and large banks. The agricultural sector, which accounts for approximately 25% of GDP, has received a less than proportionate amount of credit. Further, during the period 2000 to 2008, banks reduced lending to agriculture (Table 4) due to perceived risks and industrial transformation towards a knowledge-based economy. There is, however, no clear difference across banking groups regarding sectoral bank credit.

Table 4: Distribution of total credit to the private sector, government

Credit (Ksh million)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Banks' credit to private sector	258,600	291,900	319,400	333,900	348,200	373,800	423,800	464,200	510,000	591,600	689,700	641,200
Banks' credit to government	42,500	61,400	60,500	63,700	84,900	94,300	130,000	99,500	114,200	141,300	173,700	
163,400												
Banks' credit to other government	8,000	6,400	7,400	7,900	8,000	8,000	5,900	10,700	10,800	17,000	12,900	10,400
NBFIs' credit to private sector	27,800	28,800	24,500	25,700	16,500	17,500	15,300	16,700	13,500	13,600	11,800	21,800
NBFIs' credit to government	3,940	1,600	1,700	2,300	2,200	2,400	3,300	3,500	2,300	1,900	1,200	837
NBFIs' credit to other government	-138	-89	-63	190	20	5	92	193	11,200	1,400	1,400	1,400
Total private credit	286,400	320,700	343,900	359,600	364,700	391,300	439,100	480,900	523,500	605,200	701,500	663,000
Total credit to government	46,440	63,000	62,200	66,000	87,100	96,700	133,300	103,000	116,500	143,200	174,900	164,237
Total credit to other government	7,862	6,311	7,337	8,090	8,020	8,005	5,992	10,893	22,000	18,400	14,300	11,800
Grand total credit	340,702	390,011	413,437	433,690	459,820	496,005	578,392	594,793	662,000	766,800	890,700	839,037
% contribution to total credit												
Total private credit	84.1	82.2	83.2	82.9	79.3	78.9	75.9	80.9	79.1	78.9	78.8	79.0
Total credit to government	13.6	16.2	15.0	15.2	18.9	19.5	23.0	17.3	17.6	18.7	19.6	19.6
Total credit to other government	2.3	1.6	1.8	1.9	1.7	1.6	1.0	1.8	3.3	2.4	1.6	1.4
% contribution to private sector credit												
Banks	90.3	91.0	92.9	92.9	95.5	95.5	96.5	96.5	97.4	97.8	98.3	96.7
NBFIs	9.7	9.0	7.1	7.1	4.5	4.5	3.5	3.5	2.6	2.2	1.7	3.3

Selected bank measures relevant for BLC

Table 5 presents some selected items of the banks' balance sheets and profit and loss accounts structure for different groups of banks. Several characteristics that are relevant for the identification of the BLC can be noted regarding the banks.

Different bank characteristics

We separate banks using four characteristics: bank size (assets), bank liquidity, capitalization and bank ownership. In terms of bank size, we use the classification used by the bank supervision department of CBK. The classification is as follows: small banks (asset size less than Ksh5 billion), medium banks (assets size between Ksh5 billion and Ksh 15 billion), and large banks (asset size greater than Ksh15 billion). In terms of liquidity, we use different ranges of the liquidity ratio (net liquid assets to total short term liabilities): less liquid (liquidity ratio less than 38%), medium (liquidity ratio between 38% and 54%) and highly liquid (liquidity ratio over 54%). The statutory liquidity ratio is 20%. In terms of capitalization, we use different ranges of the total capital to risk-weighted assets ratio: less capitalization (total capital ratio less than 19%), medium capitalization (total capital ratio between 19% and 28%), and high capitalization (total capital ratio greater than 28%).

There are some general characteristics regarding these banks. First, small banks have high liquidity and capital ratios compared to large banks (Table 5). This is done to cushion them against the effects of an unfavourable deposit market. The inter-bank market is also unfavourable to the small banks. Second, foreign owned-banks are generally large (see Table 5). The rest of the characteristics are presented in sections 2.6.2 to 2.6.7.

Income from loans and advances across bank characteristics

The composition of income is dominated by loans and advances across all banking groups (Table 6). However, there are differences across bank characteristics. First, as shown in Table 6, small banks earn on average 56.1% of their total income from loans and advances compared to 47.7% for large banks. This is mainly attributed to the high lending rates they charge (Table 5). In terms of market share, large banks comprise 82% of the total loans and advances in Kenya. Second, less liquid banks earn a higher proportion of income from loans and advances compared to highly liquid banks (Table 6). This is attributed to the fact that less liquid banks hold a higher proportion of assets in loans (Table 5) and charge higher lending rates compared to highly liquid banks. Third, there is no major difference in terms of earnings from loans and advances for less and highly capitalized banks. Finally, domestic-owned banks earn a higher proportion of income from loans and advances compared to foreign-owned banks (Table 6). This is attributed to the fact that domestic-owned banks invest a higher proportion of their portfolio in loans and advances compared to foreign-owned banks (Table 5).

Income from government securities across bank characteristics

Investment in government securities is the second major source of income for banks in Kenya. This source of income is less risky compared to loans and advances. However,

there are major differences across bank characteristics. First, in terms of bank size, there is no major difference between large and small banks. However, the medium-sized banks receive a substantial proportion of their income from government securities. Second, highly liquid banks earn 25.9% of their income from government securities compared to 10.4% for less liquid banks. Third, highly capitalized banks earn 20.1% of their income from government securities compared to 15.5% for less capitalized banks. Finally, foreign-owned banks earn 29.0% from government securities compared to 12.3% for domestic-owned banks (Table 6).

Income from "fees and commissions" across bank characteristics

This is the third major source of income for banks in Kenya. There are differences across banks. First, large banks earn 19.5% of their total income from fees and commissions compared to 12.1% for small banks. Second, banks with less liquidity earn 17.6% from fees and commissions compared to 9.7% for highly liquid banks. Third, less capitalized banks earn 17.6% from fees and commissions compared to 11.1% for highly capitalized banks (Table 6).

Income from foreign exchange trading across bank characteristics

There is a major difference between domestic-owned and foreign-owned banks in terms of income from foreign exchange trading. The foreign-owned banks earn 8.3% of their total income from foreign exchange trading compared to 5.1% for domestic-owned banks. This means that the exchange rate plays a significant role in the portfolio allocation of banks. This is attributed to the differences in the proportion of foreign-denominated deposits and loans. Specifically, 21.0% of total deposits are denominated in foreign currency for foreign-owned banks compared to 13.0% for domestic-owned banks. Similarly, 20.4% of loans are denominated in foreign currency for foreign-owned banks compared to 7.9% for domestic-owned banks.

Interest expense on customer deposits across bank characteristics

Interest on customer deposits constitutes, on average, 30% of total expenses in the banking industry. However, there are differences across bank characteristics with implications for BLC. First, interest on customers' deposits for small banks is 29.6% of total expenses compared to 23.9% for large banks. This is attributed to the high deposit interest rate they pay to customers (Table 5) due to limited amounts insured by the DPF, and the perception that they are less "stable and secure" compared to the large banks. In terms of market size, about 84.0% of the deposits are held by the large banks. Small banks pay a premium for customers to place deposits with them. Second, highly liquid banks spend more on interest on customer deposits compared to less liquid banks (Table 6). Third, domestic-owned banks spend more on interest on customer deposits compared to foreign-owned banks (Table 6). This is attributed to the fact that domestic-owned banks are perceived as less "stable and secure", and thus must pay a premium for customers to place deposits with them.

Table 5: Selected indicators of bank portfolio management strategy

Measure (mean values)	Bank size			Bank liquidity			Bank capital			Bank ownership	
	Small	Medium	Large	Low	Medium	High	Low	Medium	High	Local	Foreign
1.Univariate measures											
Deposit rate (%)	4.39	5.40	3.32	4.14	4.47	4.15	3.94	4.90	4.11	4.47	3.70
Lending rate (%)	14.95	13.33	12.76	15.09	13.12	13.84	12.96	14.40	14.79	14.72	12.02
Asset size (Ksh billion)	3.26	7.59	47.10	24.00	20.79	6.26	37.64	6.09	3.48	12.42	29.76
Loan-deposit ratio	1.24	0.69	0.86	1.07	0.79	1.23	0.83	0.83	1.38	1.19	0.56
Loan-total asset ratio (%)	61.00	53.00	63.00	74.80	57.5	48.2	62.1	62.80	55.90	66.80	42.10
Total capital-risk-weighted assets ratio (%)	35.15	21.81	17.89	20.53	22.32	40.06	17.27	23.55	41.54	26.85	26.37
Liquidity ratio (%)	53.01	48.88	39.89	32.64	44.37	68.20	40.22	43.71	60.61	44.88	57.65
Bank-level money multiplier	9.53	11.61	11.62	10.26	10.89	10.45	11.12	10.65	9.84	9.86	12.40
2. Bivariate measures											
Deposit rate and lending rate correlation	0.18**	0.54***	0.28**	0.22**	0.35***	0.36***	0.32***	0.39***	0.13	0.22**	0.32**
Deposit rate and repo correlation	0.48***	0.72**	0.51***	0.36**	0.47***	0.72***	0.52***	0.49***	0.52***	0.49**	0.56***
Deposit rate and T180 rate correlation	0.50***	0.77***	0.54***	0.38**	0.52***	0.73***	0.54***	0.53***	0.54***	0.51***	0.60***
Lending rate and Tb180 rate correlation	0.37***	0.51***	0.42***	0.34***	0.49***	0.38***	0.42***	0.42***	0.38***	0.37***	0.57***

Notes: (1) *,** and *** means significant at 10%, 5% and 1%, respectively; (2) Computed from audited financial statements of banks.

Table 6: Bank income and expenses by category

	Bank size (assets)			Bank Liquidity			Bank capitalization			Bank ownership	
	Small	Medium	Large	Less	Medium	High	Less	Medium	High	Domestic	Foreign
A. Bank income sources											
Interest income	75.6	80.3	68.7	72.5	74.2	76.7	70.7	77.9	75.8	74.5	74.2
Loan advances	56.1	55.7	47.7	59.5	54.8	46.3	50.6	60.1	51.7	58.6	39.9
Government securities	15.3	21.5	16.5	10.4	14.4	25.9	15.5	14.5	20.1	12.3	29.0
Deposits and placements with banking institutions	3.8	2.4	3.7	2.1	4.0	4.2	3.8	2.7	3.7	3.2	4.3
Other interest income	0.5	0.6	0.9	0.5	1.0	0.3	0.9	0.6	0.3	0.5	0.9
Non-interest income	24.4	19.7	31.3	27.5	25.8	23.3	29.3	22.1	24.2	25.5	25.8
Fees and commissions income	12.1	10.6	19.5	17.6	14.6	9.7	17.6	12.7	11.1	14.0	14.1
Foreign exchange trading income	5.2	5.0	7.7	4.3	7.5	5.9	7.6	4.5	5.3	5.1	8.3
Other non-interest income	7.0	4.1	4.1	5.6	3.7	7.7	4.0	5.0	7.8	6.4	3.5
Total income	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
B. Bank expenses											
Interest expenses	32.1	44.0	26.8	30.2	33.6	34.5	29.8	40.3	30.1	33.7	29.6
Customer deposits	29.6	41.4	23.9	27.4	31.0	31.9	26.9	39.1	26.6	31.1	26.8
Deposits and placements from banking institutions	1.1	2.5	2.4	1.8	2.4	1.1	2.4	1.1	1.5	1.5	2.5
Other interest expenses	1.3	0.2	0.6	0.9	0.3	1.5	0.5	0.1	1.9	1.1	0.3
Operating (non-interest) expenses	67.9	56.0	73.2	69.8	66.4	65.5	70.2	59.7	69.9	66.3	70.5
Staff costs	25.9	21.5	29.2	25.8	25.8	26.5	27.6	24.0	25.9	24.3	31.2
Bad and doubtful debts	9.7	9.6	10.1	12.6	9.6	7.1	10.1	8.2	10.7	11.8	4.2
Occupancy costs	4.1	2.2	2.3	2.5	2.9	4.2	2.3	3.0	4.3	3.3	2.9
Depreciation on property and equipment	4.9	3.3	4.5	4.1	4.5	4.9	4.1	3.7	5.4	4.7	4.1
Other operating expenses	23.3	19.4	27.2	24.8	23.6	22.8	26.1	20.8	23.7	22.3	28.1
Total interest and non-interest expenses	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Notes: Computed from audited annual financial statements of banks

Expense on provisions for bad and doubtful debts across bank characteristics

Loans are classified into five categories: normal, watch, sub-standard, doubtful and bad. There are no major differences across banks except for bank liquidity and foreign-ownership. First, provisions for bad and doubtful debts comprise 12.6% for less liquid banks compared to 7.1% for highly liquid banks. This may be attributed to the fact that less liquid banks invest a higher proportion of their total assets in loans compared to highly liquid banks (Table 5). Second, 11.8% of total costs for domestic-owned banks comprise charges on provisions for bad and doubtful debts compared to 4.2% for foreign-owned banks. This reflects the difference in the loans-total assets ratio between the two categories of banks (Table 5), as well as the superior credit assessment of the foreign-owned banks.

3. Literature review

Empirical studies in the US

Kashyap and Stein (1995) analyse cross-sectional differences in the financing and lending decisions of banks of different asset sizes. Their central hypothesis is that the lending of small banks is more sensitive to monetary policy than the lending of large banks during the period 1973 to 1991. The strongest result in the study is that following monetary contraction, measured by an increase in the federal funds rate, the quantity of loans held by small banks falls while that of large banks does not.

Kashyap and Stein (2000) argue that buffer stocks (liquidity) held by banks will make it more difficult to find bank lending responses to shifts in monetary policy. They analyse cross-sectional differences of banks with different liquidity over the period 1976 to 1993. They use three different measures of monetary policy: an index based on readings of Federal Open Market Committee documents (narrative approach), the federal funds rate, and a measure based on the structural VAR model. The main finding is that the impact of monetary policy on lending is stronger for banks with less liquid balance sheets. Kashyap and Stein (2000) argue that while the results support the BLC, they do not provide information regarding its quantitative importance.

Kishan and Opiela (2000) use bank size and capital leverage over the period 1980 to 1995. They use two monetary policy indicators: changes in federal funds rate and changes in the Bernanke-Mihov (1995) indicator.[3] The main finding is that loans of small under-capitalized banks are the most responsive to monetary policy. Kishan and Opiela (2006) extend the sample period to cover 1980 to 1999, allow for expansionary and contractionary effects of monetary policy and only use the federal funds rate. Their main finding is that low-capital banks are adversely affected by contractionary monetary policy. However, expansionary monetary policy is not effective in stimulating the loan growth of low-capital banks.

Ashcraft (2006) uses bank size, capitalization and affiliation to a multi-bank holding company. He finds that during the period 1987 to 1999, stand-alone bank lending is sensitive to changes in federal funds rate while affiliated bank lending is largely unaffected by monetary policy. He also uses VAR for the period 1954 to 2002 to gauge the quantitative importance of the BLC in the US. He finds that the BLC is an insignificant part of the MTM, largely because of the low measured response of real output to aggregate bank lending.

Empirical studies in Europe

Bondt (1998) tests the existence of credit channels of the MTM in a broad sense in Europe for the years 1990 to 1995 using changes in short-term interest rates and monetary conditions index, which take into account the dollar exchange rate. The main outcome of the research is that monetary policy matters most for European banks with relatively illiquid balance sheets and for small banks. The BLC is found to be particularly strong in Germany, Belgium and the Netherlands, while in France and Italy, a BLC also exists when the stance of monetary policy is not measured by a monetary conditions index, which also takes into account dollar exchange rate developments. In the UK, the BLC is non-existent or dominated by loan and deposit demand factors of bank customers.

Farinha and Marques (2001) investigate the existence of the BLC in the MTM using Portuguese micro bank data for the period 1990 to 1997. The study estimates a "structural loan supply equation" using variables in levels instead of first difference. Using interest rate as a measure of monetary policy, the study concludes that there is evidence of the existence of a bank lending channel, and that the importance of the BLC is larger for under-capitalized banks.

Using a panel data approach, Altunbas, Fazylov and Molyneux (2002) examined the evidence of a bank lending channel in Europe during the period 1990 to 1999. They classify banks according to asset size and capital strength and use changes in short-term market rates as a measure of monetary policy. Using a set of panel equations, the main finding of the study is that across the European Monetary Union (EMU), under-capitalized banks (of any size) tend to respond more to changes in monetary policy. At country level, they find strong evidence of a BLC in Italy and Spain. They conclude that the BLC is more prevalent for under-capitalized banks operating in small EMU countries.

Loupias, Savignac and Sevestre (2002) examine the possible existence of a bank lending channel in France during the period 1993 to 2000 using the three-month inter-bank rate as a measure of monetary policy. They separate banks according to bank size, liquidity and capitalization. The main result is that illiquid banks are more sensitive to a tightening of monetary policy. They find that bank size and capitalization have no significant impact on bank lending.

Contrary to previous studies that use bank-level data, Huang (2003) tests the existence of a BLC in the UK using balance sheet data for a panel of UK-listed firms over the period 1975 to 1999. He uses selected bank base rates as an indicator of changes in monetary policy. The main result is that a higher interest rate induces more bank lending to listed companies, but this effect diminishes if monetary policy becomes tight enough to impose severe constraints on bank loan lending.

Gambarcorta and Mistrulli (2004) study the Italian banks during the period 1992 to 2001. They use short-term interest rates (repurchase agreements for the period 1992 to 1998 and main refinancing operations of European Central Bank during the period 1999 to 2001). They find that well-capitalized banks can shield their lending from monetary policy shocks as they have easier access to non-deposit fundraising.

Opiela (2007) identifies the BLC using data on the banking system in Poland during the period when deposit guarantees were differentially applied (1995 to 1999) and the post-1999 period. He finds that banks with partial guarantees have a stronger loan response to monetary policy than banks with full deposit guarantee.

Empirical studies in Sub-Saharan Africa

In Sub-Saharan Africa, research on BLC has lagged behind. There are a few studies based on South Africa.

Sichei (2005) studies the existence of BLC using panel data techniques on quarterly bank-level data for the period 2000 to 2004. He uses the repo rate as a proxy of monetary policy, while bank size and capitalization are used as bank characteristics. He finds that banks with strong balance sheets in terms of capital asset ratio and total assets are affected less by monetary policy. However, Ludi and Ground (2006), using a VAR approach, find that in South Africa credit is mainly driven by demand factors, implying non-existence of BLC. The difference in the results could be explained by the different approaches used in disentangling loan demand and loan supply effects.

In Kenya, we are not aware of any work on BLC using bank-level data. The closest is the work on monetary transmission in Kenya by Cheng (2006) using VAR, which finds that an exogenous increase in short-term interest rates (repo) tends to be followed by a decline in prices and an appreciation in nominal exchange rate, without significant impact on output.

4. Methodology

Theoretical framework of a Bank-Lending Channel

The BLC attributes the effects of monetary policy to a shift in the supply of loans of some banks, and that some of the borrowers from these banks being bank-dependent (Kishan and Opiela, 2006). The first generation of BLC models motivated the departure from the Miller-Modigliani axiom of irrelevance of a firm's funding structure on the basis of asymmetric information between borrowers and lenders about the characteristics of individual projects (Stiglitz and Weiss, 1981). Contractionary monetary policy can decrease loan supply due to the credit market imperfections faced by some banks. Conversely, expansionary monetary policy increases loan supply due to the lack of constraints on the lending of some banks. Thus, BLC will exist if, for a given stance of monetary policy, there are cross-sectional asymmetric responses by constrained and unconstrained banks.

Under the interest rate channel, there are two assets - money and bonds - and banks do not perform any unique function other than being a conduit for funds. In the BLC, there are three assets: money, publicly-issued bonds, and intermediated loans. These assets differ from each other, and the banking sector is special in two ways: it creates money and makes loans, which the household sector cannot do.

Kashyap and Stein (1994) point out two critical factors about the BLC. First, the BLC rests on the premise that bank loans and publicly-issued bonds are not perfect substitutes on the liability side of the balance sheets of firms. It does not depend on the fact that there is quantity rationing in the loan market as initially thought. Second, the essence of the BLC can be captured in a wide range of economic models. The Bernanke and Blinder (1988) model extends the IS-LM framework to incorporate the BLC. However, the BLC transcends the IS-LM framework in which prices are assumed to be temporarily fixed. It is possible to generate imperfect price adjustment while still preserving the other necessary building blocks of the BLC using a wide range of frameworks such as the "limited participation" dynamic general equilibrium models introduced by Grossman and Weiss (1983) and Rotemberg (1984).

Model specification

The methodological framework of this study hinges around the key conditions that must hold for a BLC to exist, and the difficulties faced in disentangling loan supply from demand. Mishkin (1995) schematically presented Bernanke and Blinder (1988)

conditions as follows:

$$\begin{aligned}&\left(M\downarrow\right)i\uparrow\Rightarrow bank\ deposits\downarrow\left(Bank\ reserves\right)\\&\Rightarrow bank\ loans\downarrow\Rightarrow\twoheadrightarrow\downarrow\Longleftrightarrow C\downarrow\Longleftrightarrow\Rightarrow\Leftarrow\downarrow,P\downarrow\end{aligned}\tag{1}$$

The study adapts the model developed by Farinha and Marques (2001), which draws heavily from Bernanke and Blinder (1988). We differ by allowing the demand and supply of deposits to be determined by the nominal exchange rate, given the role of foreign-currency deposits and loans in Kenya's banking sector. The model assumes that the economy comprises the non-banking sector, the banking sector and the central bank. The central bank implements monetary policy, either by changing the cash ratio or controlling the repo rate by conducting open market operations. Banks react by changing the amount of reserves as well as other items on their balance sheets, such as holding of government securities.

There are three assets in the model: money (deposits) held by the non-bank private sector with banks, bonds held by the private sector and intermediated loans.

In the money market, a conventional LM curve is assumed. Demand for money arises from the transactions and precautionary and speculative motives and depends on the interest rate, income and exchange rate. In line with Bernanke and Blinder (1988), we ignore cash (currency outside banks).

$$\ln\left(\frac{D}{P}\right)^{d}_{it} = \underset{}{\beta_{10}} + \underset{(-)}{\beta_{11}\, i^{tb}_{it}} + \underset{(+)}{\gamma_{11}\, i^{d}_{it}} + \underset{(+)}{\gamma_{12}\ln y_t} + \underset{(-)}{\gamma_{13}\ln e_t} \tag{2}$$

Where D_t is the nominal deposits (local and foreign currency) held by the non-bank public at a typical bank, P_t is the price level, y_t is real GDP (a scale variable), i^{tb}_{t} is the nominal interest rate on bonds to capture the opportunity cost of holding money, is nominal deposit rate to capture own return to money, and i^{d}_{it} is the nominal exchange rate in the spirit of Arango and Nadiri (1981).

The supply of deposits is equal to bank reserves, times the money multiplier (Bernanke and Blinder, 1988). The money multiplier is a function of the opportunity cost of holding money (i^{tb}_{t}), the repo rate, and the exchange rate ($\ln e_t$).

Equation 3 presents money supply in form of bank deposits:

$$\ln\left(\frac{\mathrm{D}}{P}\right)^{s}_{it} = \underset{}{\beta_{20}} + \underset{(+)}{\beta_{21}\, i^{tb}_{t}} + \underset{(+)}{\gamma_{21}\ln\left(\frac{R}{P}\right)_{it}} + \underset{(-)}{\gamma_{22}\ r_t} + \underset{(+)}{\gamma_{23}\ln e_t} \tag{3}$$

Where D^{s}_{t} is the nominal deposits (local and foreign currency) held by the non-

bank public at a typical bank, P_t is the price level, R_t is the bank reserves (cash ratio requirement, clearing account balances and cash in till),[4] i_t^{tb} is the nominal interest rate on bonds, r_t is nominal repo rate, which is the proxy for monetary policy, and $\ln e_t$ is the nominal exchange rate.

There are a number of possible variables to use as a proxy of monetary policy. These include the CBR introduced in May 2006, Treasury bill rate, repo rate (withdrawing liquidity) and reverse repo rate. CBR would have been the most appropriate variable but there are limited observations available. The Treasury bill rate is determined by the activities in government operations. We follow Cheng (2006) in using the repo rate as a proxy of monetary policy stance.

In the credit market, demand for real credit by the non-bank private sector is given as in Equation 4.

$$\ln \left(\frac{C}{P}\right)^{d}_{it} = \underset{}{\beta_{30}} + \underset{(-)}{\beta_{31}\, lr_{it}} + \underset{(+)}{\gamma_{31} \ln \gamma_{it}} + \underset{(-)}{\gamma_{32} \ln HI_t} \tag{4}$$

Where $C_{it}^{\,d}$ is the credit demand (local currency and foreign currency), P_{it} is the consumer price index, lr_{it} is the lending rate (weighted average of local currency denominated and foreign currency denominated loans), y_t captures the transactions demand for credit, and HI_t is the Herfindahl index to capture the degree of competition.

Testing the hypothesis $\beta_{31} \neq 0$ captures the idea that borrowers cannot fully insulate their real spending from changes in the availability of bank credit.

The credit loan supply is given by equation 5:

$$\ln \left(\frac{C}{P}\right)^{s}_{it} = \underset{}{\beta_{40}} + \underset{(+)}{\beta_{41}\, \ln \left(\frac{D}{P}\right)_{it}} + \underset{(+)}{\beta_{42}\, lr_{it}} + \underset{(-)}{\gamma_{41} \ln HI_t} + \underset{(-)}{\gamma_{42} \ln NI_{it}} \tag{5}$$

Where $C_{it}^{\,s}$ is the credit demand, P_{it} is the consumer price index, $\ln \left(D/P\right)_{it}$ is the real deposits, lr_{it} is the lending rate, $\ln HI$ is the Herfindahl index to capture the degree of competition, and $\ln NI_{it}$ is the non-interest income for a bank to capture the possibility of substitution with lending. The specification of the loan supply equation with deposits as an explanatory variable closely follows Bernanke and Blinder (1988).

In line with Bernanke and Blinder (1988), equations 2 and 3 determine the equilibrium interest rate and deposits in the money market.

$$i_t^{tb} = \underset{}{\mu_0} + \underset{(-)}{\mu_1 \ln \left(\frac{R}{P}\right)} + \underset{(+)}{\mu_2\, r_t} + \underset{(+)}{\mu_3\, i_{it}^{d}} + \underset{(+)}{\mu_4 \ln \gamma_t} + \underset{(-)}{\mu_5 \ln e_t} \tag{6}$$

$$\ln\left(\frac{D}{P}\right)_t = \underset{}{\kappa_0} + \underset{(+)}{\kappa_1 \ln\left(\frac{R}{P}\right)} + \underset{(-)}{\kappa_2 r_t} + \underset{(+)}{\kappa_3 i_{it}^d} + \underset{(+)}{\kappa_4 \ln \gamma_t} + \underset{(-)}{\kappa_5 \ln e_t} \quad (7)$$

Where the relationship of the reduced-form parameters and the structural parameters are presented in appendix B.

We abstract from the issues of credit rationing presented in Baltensperger (1978) and Bester (1985) and use equations 4 and 5 to determine the equilibrium lending rate and credit:

$$lr_{it} = \underset{}{\gamma_0} + \underset{(-)}{\gamma_1 \ln\left(\frac{D}{P}\right)_{it}} + \underset{(+)}{\gamma_2 \ln y_t} + \underset{(?)}{\gamma_3 \ln HI_t} + \underset{(+)}{\gamma_4 \ln NI_{it}} \quad (8)$$

$$\left(\frac{C}{P}\right)_{it} = \underset{}{\rho_0} + \underset{(+)}{\rho_1 \ln\left(\frac{D}{P}\right)_{it}} + \underset{(+)}{\rho_2 \ln y_t} + \underset{(+)}{\rho_3 \ln HI_t} + \underset{(+)}{\rho_4 \ln NI_t} \quad (9)$$

Where the relationship of the reduced-form parameters and the structural parameters are presented in appendix B.

Identification issues

The implications of the BLC are not easy to test empirically and, as pointed out by Bernanke and Gertler (1995), measuring the potency of the channel is a challenging task. Several strategies have been applied in the literature. First, Bernanke and Blinder (1992) pioneered a strategy where the BLC is tested using vector autoregression (VAR) analysis by examining relationships either between quantity variables (output, money, and loans) or between price variables (interest rates). The second approach uses cross-sectional implications of the BLC in reduced-form loan supply equation using panel data. The expectation is that small banks are affected more by monetary contractions (Kashyap and Stein, 1995; 2000). Equation 10 is the basic form of the reduced-form supply used under this approach. It is derived by solving the model using equations 6, 7, 8 and 9.

$$\ln\left(\frac{C}{P}\right)_{it}^{s} = \underset{}{\theta_0} + \underset{(-)}{\theta_1 r_{it}} + \underset{(+)}{\theta_2 r z_{it}} + \underset{(+)}{\theta_3 \ln\left(\frac{R}{P}\right)_t} + \underset{(-)}{\theta_4 \ln\left(\frac{R}{P}\right)_t z_t} .. + \varepsilon_{it} \quad (10)$$

Where z_{it} is a measure of the sources of bank's health and the heterogeneity that affects the external finance premium such as bank size, and r is the same monetary policy instrument used in Equation 3. This approach has been applied by Kashyap and Stein (1994, 1995 and 2000) and Kishan and Opiela (2000, 2006). The third approach uses cross-sectional implications of the BLC from single or a system of "structural panel data equations". This approach has been applied by Farinha and Marques (2001) and Altunbas, Fazylov and Molyneux (2002).

Our identification strategy blends the structural equations approach of Farinha and Marques (2001) and system of equations of Altunbas, Fazylov and Molyneux (2002). We extend the work by using simultaneous panel data models to take into consideration correlations between and among money market and credit market equations.

Equations 2, 3, 4 and 5 are used as stated, but an interaction term is added in equations 3 and 5 in the spirit of the models suggested by Kashyap and Stein (1995).

$$\ln\left(\frac{D}{P}\right)^{s}_{it} = \underset{(+)}{\beta_{50}} + \underset{(+)}{\beta_{51}}\, i_t^{tb} + \underset{(+)}{\gamma_{51}} \ln\left(\frac{R}{P}\right)_{it} + \underset{(-)}{\gamma_{52}}\, r_t + \underset{(+)}{\gamma_{53}} \ln e_t + \underset{(-)}{\gamma_{54}}\, Z_{it} + \underset{(-)}{\gamma_{55}}\, r_t Z_{it} \tag{11}$$

$$\ln\left(\frac{C}{P}\right)^{s}_{it} = \underset{(+)}{\beta_{60}} + \underset{(+)}{\beta_{61}} \ln\left(\frac{D}{P}\right)_{it} + \underset{(-)}{\beta_{62}} \ln\left(\frac{D}{P}\right)_{it} z_{it} + \underset{(+)}{\beta_{63}}\, lr_{it} + \underset{(-)}{\beta_{64}}\, lr_{it} z_{it} + \underset{(-)}{\gamma_{61}}\, z_{it} \tag{12}$$

$$+ \underset{(+)}{\gamma_{62}} \ln HI_t + \underset{(-)}{\gamma_{63}} \ln NI_{it}$$

The sources of a bank's health and heterogeneity (z_{it}) are proxied by bank size (s_{it}), capitalization (L_{it}), liquidity (K_{it}) and foreign ownership.

Size is computed as the difference from each time period average as follows;

$$s_{it} = A_{it} - \frac{I}{N}\sum_{i=1}^{N} A_{it} = A_{it} - \bar{A}_{\bullet t} \tag{13}$$

Equation 13 captures the pure differential effects between banks. For each time period, the variable averages zero, being negative for banks whose size is below average and positive for banks whose size is above average. Banks are separated into three groups: total assets less than Ksh5 billion (small banks), total assets between Ksh5 billion and Ksh15 billion (medium size) and total assets greater than Ksh 15 billion (large banks).[5]

There are three statutory capital adequacy requirements in Kenya: a core capital of not less than 8% of total risk-weighted assets plus risk-weighted off-balance sheet items, core capital of not less than 8% of deposit liabilities, and a total capital of not less than 12% of total risk-weighted assets plus risk-weighted off balance sheet items. The capitalization measure is computed as the deviation from period average of excess capital ratio.

$$K_{it} = \left(k_{it} - 0.12\right) - \frac{I}{N}\sum_{i=1}^{N}\left(k_{it} - 0.12\right) \tag{14}$$

Where k_{it} is the total capital to risk-weighted assets ratio. The use of the capital ratio is in line with the model of Peek and Rosengren (1995) in which they show that loss of bank capital resulting in binding capital requirements causes a bank to behave differently than it would if the requirements were not binding. The use of excess capital ratios is in line with Gambocorta and Mistrulli (2004). Banks are separated into three peer groups: capital ratio less than 19% (less capital), capital ratio between 19% and 28% (moderate capital) and capital ratio above 28% (high capital).

In the case of liquidity, it is noted that liquidity requirements vary from bank to bank depending on cash flows. Over the period of analysis, banks were required to maintain a statutory minimum of 20% of their total liabilities in liquid assets. Considering this statutory minimum and the fact that banks generally hold excess liquid assets, the liquidity measure is computed as difference from each time period, average of excess liquidity ratio:

$$L_{it} = (l_{it} - 0.2) - \frac{I}{N}\sum_{i=1}^{N}\left(l_{it} - 0.2\right) \tag{15}$$

Where l_{it} is the liquidity ratio. Banks are divided into three peer groups: liquidity ratio of above 54% (high liquidity), liquidity ratio between 38% and 54% (moderate liquidity) and less than 38% (less liquid).

It is, however, important to note that the addition of the interaction terms to equations 3 and 5 changes the definition and meaning of the coefficients (even if the interaction coefficients are not significant). The coefficients no longer measure main effects but rather conditional effects. For instance, the effect of the repo rate on the deposit supply equation (Equation 11) becomes $\gamma_{52} + \gamma_{55} Z_{it}$ instead of γ_{52}. This requires z_{it} to be centred at mean zero or be categorical in nature, which is done in our analysis. The computation of bank size, liquidity and capitalization centres them at mean zero. Thus, the effect of the repo rate is equal to γ_{52} if z_{it},i.e. for an average bank. The same applies for the credit supply coefficients.

This study focuses mainly on the deposits supply (equations 3 and 11) and credit supply (equations 5 and 12), which are important in returning a verdict as to whether

a BLC exists or not. Two complementary strategies are followed. First, relevant coefficients are compared in terms of direction and magnitude across the peer groups for size, capitalization and liquidity. In terms of credit supply, we compare the deposit and lending rate coefficients. The main issue is that the BLC is strong when the coefficient for real deposits is positive and high. Additionally, the lending rate coefficient must be small (flatter credit supply) for a BLC to exist.

Second, in view of the possibility of the results being affected by different sample sizes, interactions are used. Specifically, equations 3 and 5 are replaced with equations 11 and 12, respectively. Bank characteristics are interacted with the repo rate (Equation 11), deposits and lending rate (Equation 12).

Estimation techniques and procedures

The choice of the estimation strategy is informed by the need to capture simultaneous decisions in the money and credit markets, as well as address issues of non-stationarity of some variables.

There are two options to the estimation. The first strategy is to estimate reduced-form equations 6, 7, 8 and 9 as a system, and recover the structural parameters using relationships in appendix B. The second option is to estimate the structural parameters directly, with equilibrium relationships imposed. We use the second strategy since it is easier and direct. We apply simultaneous panel equation methods, which take into consideration cross-equation correlation in the spirit of the Zelner's seemingly unrelated regression (SUR) model as well as providing a platform to estimate "structural parameters" for the system of four equations (equations 2, 3, 4 and 5 or equations 2, 11, 4, 12). Specifically, the study uses the error components three stage least squares (EC3SLS) suggested by Baltagi (1981) and expounded in Baltagi (2008; 2009). The issue of non-stationary series and panel cointegration is addressed by performing panel unit roots and cointegration.

The structural model is identified with respect to order and rank conditions (Table A1 in the appendix). The EC3SLS takes into consideration within banks and between banks, error components, as well as cross-equation correlations. The specific steps followed are presented in Baltagi (2008; 2009) and reproduced in section A of the appendix of this study.

Although most studies on BLC use lagged regressors for credit supply to capture lock-in effects, the study does not use a dynamic panel due to the failure to achieve positive definite matrix of the scaled difference of the error covariance matrices of within two stage least squares (W2SLS) and between two stage least squares (B2SLS) estimators as required in the condition stated in equation A4 in appendix A.

Data measurements and sources

The study uses commercial banks' annual audited balance sheet data for the period 2001-2008 collected from the published financial statements and disclosure reports, as well as data from the CBK. A total of 40 commercial banks that have been consistently in operation within the study period are covered. However, the study uses Peek and

Rosengren (1995) methodology in which merged banks are treated as a single bank throughout the sample (i.e. as if the merger took place at the beginning of the sample). This is the same approach used by Kishan and Opiela (2000). The implementation of this criterion left us with a sample of 37 banks out of the 40.

Private credit covers loans and advances. The deposit variable from the private sector (D) is computed as total deposits less deposits from central government, local government, commercial banks, and non-bank financial institutions. Total bank reserves are computed as cash in till (Kenya shillings and foreign currency), clearing account balances at CBK, and cash ratio requirement balances at CBK.[6] Prudential measures (liquidity ratio and capital adequacy ratio) are computed in line with the prudential guidelines issued by CBK in 2006 (Central Bank of Kenya, 2006). Specifically, liquidity ratio is computed by dividing net liquid assets by short-term liabilities (net deposit liabilities plus other liabilities maturing within 91 days). Total capital ratio is computed as total capital (core capital plus supplementary capital) divided by total risk-weighted assets. Other variables are collected from economic surveys, CBK Bank Supervision Department reports, and CBK statistical bulletins.

It is assumed that nominal interest rates pick up the inflation effects through the Fisher relationship. All interest rates are divided by 100 to facilitate their interpretation as semi-elasticities.

The choice of the period 2001-2008 is predicated on the availability of bank-specific data and the fact that it covers slump and boom periods.

5. Estimation results

Panel Unit Root and Cointegration Tests

Non-stationarity in situations where the time dimension is fairly large can bias results (Baltagi, 2008). Although the panel in our study is micro in nature (large N and small T), we perform panel unit root tests on each variable to avoid the potential problem of spurious regression.

There are two groups of panel unit root tests: those that assume individual (bank) unit root and those that assume common unit root. Im, Pesaran and Shin (2003) allow for an individual unit root process. Levin, Lin and Chu (2002) and Hadri (2000) assume that there is a common unit root identical for all banks. However, the Hadri (2000) test has a null of no unit root. We use tests that assume individual bank unit root to allow for heterogeneity. The results are presented in appendix Table A2 and show that all the variables are non-stationary, with the exception of inflation rate, which is excluded from the analysis.

The motivation for the panel cointegration test is to ensure that the system of equations is not spurious. The study uses residual-based tests suggested by Pedroni (2004) and Kao (1999). These tests extend the Engle-Granger two-step framework to tests involving panel data. The results are presented in Table A3 in the appendix. Both tests reject the null of no cointegration, implying that the system of equations form long-run equilibrium relationships.

Testing of the BLC conditions

The BLC conditions embedded in Equation 1 are tested in our analysis. First, there must be investors who depend on bank loans for their investments. Second, CBK's monetary policy should be able to influence deposit mobilization activities of banks. Third, bank loans should depend on deposits held by commercial banks. In other words, commercial banks should be engaged in transforming short-term liabilities (deposits and others) into long-term loans. The final condition that there must be imperfect price adjustment that prevents any monetary policy shocks from being neutral is assumed.

Investors should be bank-dependent

The first condition requires that intermediated loans and capital market financing (e.g, commercial paper and corporate bonds) should not be perfect substitutes for some

firms on the liability side of their balance sheets. Thus, some firms must be unable to frictionlessly offset a decline in the supply of loans by other forms of external finance.

Although it is difficult to prove this condition directly due to the lack of firm-level panel data in Kenya, we rely on theoretical and empirical arguments rooted in corporate finance literature presented by Kashyap and Stein (1994) regarding the existence of bank-dependent customers when capital markets are imperfect. These include an ability to monitor certain types of borrowers in the face of asymmetric information, and/or moral hazard (Fama, 1990) and lock-in-effects of banking relationships that make it costly to switch lenders (Sharpe, 1990).

Monetary policy has implications on the internal finance (Carpenter, Fazzari and Petersen, 1995). They find that tight monetary policy will reduce demand in interest-sensitive sectors of the economy. Further, the small contractions in demand can generate large proportionate changes in business income and cash flow, especially when a substantial proportion of firms' costs are fixed in the short-run. These reductions in the flow of internal finance will lead to lower investment for financially constrained firms, propagating the monetary shock to more sectors of the economy and magnifying its impact on real activity. In Kenya, most large firms have a "pecking order of financing choices" as suggested by Caprio and Demirguc-Kunt (1997), whereby they prefer using internal finance before they resort to external finance. According to a survey carried out in 2003/2004 on manufacturing firms in Kenya, retained earnings was ranked as the first financing choice followed by bank loans (World Bank et al., 2004). Firms with credit rating can resort to financing their activities from the capital market using equity shares and corporate debt instruments (commercial paper and corporate bonds).

For the small-and medium-sized enterprises (SMEs), their choices are limited to internal finance, micro-finance institutions (MFIs) and banks. The MFIs have successfully replicated the Grameen Bank model of microfinance in Bangladesh of delivering loans to the "marginal borrowers" by using group guarantees instead of formal collateral. However, they serve a limited number of people, charge very high interest rates, and depend to a great extent on donor funding. Additionally, successful MFIs have graduated to and now offer formal commercial bank services, while non-bank financial intermediaries, mortgage companies and building societies have merged with banks under the "universal banking" policy adopted in the late 1990s.

Monetary policy and deposits mobilization

Bank size

The larger the bank, the easier it is to replace deposits with external finance, and thus the smaller the impact of monetary policy on loan supply. Table 7 presents the results when banks are grouped into three asset-size classes. The demand for deposits is generally in line with expectation in Equation 2. The supply of deposits' equation excludes the 182-day Treasury bill rate due to the high correlation with the repo rate.[7] The effect of monetary policy on deposit mobilization is tested in the deposit supply equation by checking whether monetary policy (repo rate) affects bank deposit supply negatively and heterogeneously or not. We find that the coefficient for the small banks is more

negative than for large banks. However, the coefficient for the repo rate is the lowest for medium-sized banks, implying that the magnitude of this effect does not vary in a systematic way across size classes.

The inconclusive results regarding the BLC in Table 7 could be attributed to the fact that the sample size differs for each size class. Table 11 reports the results using the same sample size and interaction terms (Equation 11). With interaction, the coefficient for the repo rate measures "conditional effect" and not "partial effect". This will be the case even when the interaction term is statistically insignificant. The "conditional effect" of the repo rate on deposit supply is -1.466+0.349*size. However, since the coefficient of the interaction term is insignificant, we do not use the interaction to make conclusions regarding the BLC. Thus, we retain the conclusion that the deposit supply of small banks is more affected by monetary policy than that of large banks. This makes sense, since small banks have high costs of funds (Table 6).

Table 7: EC3SLS results for deposit demand and supply using bank size

Deposit demand	**Small Banks (Assets<Ksh5 billion)**	**Medium Banks (Ksh 5billion <Assets< =Ksh15bn)**	**Large Banks (Assets>Ksh15 billion)**
Constant	0.001(0.990)	0.004(0.979)	0.007(0.948)
182-day Tbill rate	-1.591(0.004)***	-1.571(0.015)**	-1.947(0.006)***
Deposit rate	1.977(0.018)**	0.529(0.586)	1.927(0.090)*
Real GDP (log)	0.730(.000)***	1.227(0.000)***	1.182(0.000)***
Exchange rate (log)	0.459(0.000)***	-0.077(0.330)	0.373(0.001)***
Deposit supply			
Constant	0.014(0.853)	0.039(0.686)	0.014(0.815)
Bank reserves (log)	0.526(0.000)***	0.827(0.000)***	0.495(0.000)***
Repo rate	-1.516(0.000)***	-2.402(0.000)***	-1.149(0.021)**
Exchange rate (log)	1.396(0.000)***	0.819(0.000)***	1.428(0.000)***
Sample size	19 banks, 8 years	7 banks, 8 years	11 banks, 8 years

Notes: These results are estimated as a single system with results in Table 12. The R-square for the deposit demand equation are: 0.9182 (small banks), 0.9656 (medium size) and 0.9911 (large banks). The R-square for the deposit supply equation are: 0.9666 (small banks), 0.9803 (medium size) and 0.9797 (large banks).

Bank liquidity

Liquid banks can draw on their excess reserves of cash and securities to protect their loan portfolio. Table 8 presents the results for when banks are grouped into three liquidity ratio classes. The deposit demand is not in line with economic theory, with the exception of the medium-liquid banks. For the low and high liquid banks, the interest rate coefficients have the opposite signs.

The effect of monetary policy on deposit mobilization is tested in the deposit supply equation by checking whether the repo rate affects bank deposit supply negatively and heterogeneously or not. The coefficient for the repo rate in the deposit supply equation is more negative for low-liquid banks compared to high-liquid banks, as expected by the BLC. However, the coefficient for the repo rate for medium-liquid banks is the most

negative, implying that the magnitude of the effect does not vary in a systematic manner across liquidity classes.

The results in Table 8 could be affected by the differences in sample sizes across the three liquidity groups. Table 11 presents results using same sample size and interaction of liquidity with repo rate. The "conditional effect" of the repo rate on deposit supply is -1.842-2.514*liquidity. This is more negative for high-liquid (positive liquidity variable) banks than low-liquid (negative liquidity variable) banks. This is contrary to the findings in Table 8, but the results in Table 11 are reliable, given the fact that the same sample size is used. We, therefore conclude that the deposit supply of high-liquid banks is affected more by monetary policy compared to low-liquid banks.

This makes sense in the Kenyan case, since high-liquid banks have high costs of funds as seen by the high interest expenses (Table 6).

Table 8: EC3SLS result for deposit demand and supply using bank liquidity

Deposit demand	Low-Liquid (Ratio<38%)	Medium Liquid (Ratio 38%-54%)	High-Liquid (Ratio>54%)
Constant	0.005(0.961)	-0.003(0.970)	-0.014(0.963)
182-day Treasury bill rate	-0.138(0.902)	-1.731(0.011)**	0.700(0.384)
Deposit rate	-3.651(0.036)**	2.37(0.018)**	-2.620(0.034)**
Real GDP (log)	1.131(.000)***	1.070(0.000)***	0.485(0.000)***
Exchange rate (log)	0.181(0.348)	0.197(0.061)*	0.915(0.000)***
Deposit supply			
Constant	0.012(0.763)	0.091(0.325)	0.087(0.554)
Bank reserves (log)	0.637(0.000)***	0.443(0.000)***	0.368(0.000)***
Repo rate	-1.292(0.000)***	-1.712(0.000)***	-1.179(0.004)***
Exchange rate (log)	1.055(0.000)***	1.174(0.000)***	1.139(0.000)***
Sample size	12 banks, 8 years	13 banks, 8 years	12 banks, 8 years

Notes: These results are estimated as a single system with those in Table 13. The R-square for the deposit demand equation are: 0.9774 (low-liquid), 0.9534 (medium liquid) and 0.8270 (high-liquid). The R-square for the deposit supply equation are: 0.9654 (low-liquid), 0.7505 (medium-liquid) and 0.7546 (high-liquid).

Bank capitalization

Poorly capitalized banks have less access to non-deposit funds, which forces them to cut back on loans more than well capitalized banks, following tight monetary policy. Table 9 presents the results when banks are divided into three capital categories. The demand for money is generally in line with economic theory. The effect of monetary policy on deposit mobilization is tested in the deposit supply equation by checking whether the repo rate affects bank deposit supply negatively and heterogeneously or not. We find that the coefficient for the repo rate in the deposit supply equation is negative and statistically significant for all groups of banks. However, it is more negative for high-capital than for low-capital banks, contrary to the BLC.

The results in Table 9 could be affected by the differences in sample sizes across the three total capital to risk-weighted assets ratio groups. Table 11 presents results using the same sample size and interaction of capital ratio with repo rate. The "conditional effect" of the repo rate on deposit supply is -1.743-0.750*capital. Since the coefficient

of the interaction term is statistically insignificant, it is difficult to make any conclusive statements. We thus retain the conclusion that the deposit supply of high-capital banks is affected more by monetary policy. This makes sense given the fact that high-capital banks have a high cost of non-deposit funds (Table 6).

Table 9: EC3SLS result for deposit demand and supply using bank total capital to risk-weighted assets ratio

Deposit demand	Low-capital (Ratio<19%) Statutory=12%	Medium-capital (Ratio 19%-28%) Statutory=12%	High-capital (Ratio>28%) Statutory=12%
Constant	0.075(0.548)	-0.001(0.986)	1.8e-04(0.999)
182-day Treasury bill rate	-0.381(0.600)	-2.181(0.001)***	-2.064(0.955)
Deposit rate	-0.382(0.736)	2.538(0.017)**	3.491(0.002)***
Real GDP (log)	0.978(0.000)***	0.956(0.000)***	0.943(0.000)***
Exchange rate (log)	0.612(0.004)**	0.267(0.000)***	0.077(0.545)
Deposit supply			
Constant	0.021(0.744)	0.011(0.877)	0.010(0.898)
Bank reserves (log)	0.446(0.000)***	0.616(0.000)***	0.595(0.000)***
Repo rate	-0.952(0.025)**	-1.746(0.000)***	-1.632(0.001)**
Exchange rate (log)	1.405(0.000)***	1.051(0.000)***	0.968(0.000)***
Sample size	14 banks, 8 years	10 banks, 8 years	13 banks, 8 years

Notes: These results are estimated as a single system with those in Table 14. The R-square for the deposit demand equation are: 0.9781 (low-capital), 0.9836 (medium-capital) and 0.9456 (high-capital). The R-square for the deposit supply equation are: 0.9225 (low-capital), 0.9895 (medium-capital) and 0.9529 (high-capital).

Bank foreign ownership

Foreign-owned banks are likely to mitigate the impact of monetary policy on deposit mobilization. Table 10 presents results when banks are grouped on the basis of foreign and local ownership. The demand for money is generally in line with economic theory, especially for the foreign-owned banks. The coefficient for the repo rate in the deposit supply equation is negative and statistically significant for both groups of banks. However, the coefficient for the repo rate is more negative for domestic-owned banks than for the foreign-owned banks. Thus, domestic-owned banks are more dependent on CBK's monetary policy compared to foreign-owned banks, as expected when the BLC is in operation. The results in Table 10 could be affected by the differences in sample sizes for domestic and foreign-owned banks. Table 11 presents results using the same sample size and interaction of capital ratio with repo rate. The "conditional effect" of the repo rate on deposit supply is -1.714+0.024*ownership. However, the coefficient for the interaction term is statistically insignificant, implying that the foreign ownership variable cannot discriminate banks to identify the BLC at the deposit mobilization level. We therefore rely on the Table 10 results and conclude that deposit supply for domestic-owned banks is more dependent on monetary policy. This makes sense in the Kenyan case given that domestic-owned banks have a high cost of funds (Table 6). Foreign-owned banks are generally perceived as "stable and secure" and use both domestic and foreign capital to fund their operations.

Table 10: EC3SLS result for deposit demand and supply using foreign-ownership dummy

Deposit demand	Domestic-owned banks	Foreign-owned banks
Constant	-0.001(0.990)	-0.015(0.888)
182-day Tbill rate	-1.194(0.158)	-2.599(0.006)***
Deposit rate	0.669(0.600)	3.927(0.014)***
Real GDP (log)	1.123(0.000)***	0.622(0.000)***
Exchange rate (log)	0.001(0.996)	1.045(0.000)***
Deposit supply		
Constant	0.030(0.530)	0.036(0.573)
Bank reserves (log)	0.542(0.000)***	0.452(0.000)***
Repo rate	-1.547(0.000)***	-0.822(0.040)***
Exchange rate (log)	1.074(0.000)***	1.331(0.000)***
Sample size	27 banks, 8 years	10 banks, 8 years

Notes: These results are estimated as a single system with those in Table 15. The R-square for the deposit demand equation are: 0.9636 (domestic-owned) and 0.9394 (foreign-owned). The R-square for the deposit supply equation are: 0.8890 (domestic-owned) and 0.9191 (foreign-owned).

Table 11: EC3SLS results for deposit demand and supply using interaction terms (Equation 11)

Deposit demand	Size (z_{it} = *size*)	Liquidity (z_{it} = *liquidity*)	Capital (z_{it} =*capital*)	Foreign-ownership (z_{it} = *foreign ownership*)
Constant	-0.008(0.800)	-0.006(0.848)	0.013(0.728)	-0.009(0.775)
182-day Tbill rate	-2.931(0.000)***	-2.946(0.000)***	-2.684(0.000)***	-2.912(0.000)***
Deposit rate	4.438(0.000)***	4.465(0.000)***	4.069(0.000)****	4.396(0.000)***
Real GDP (log)	0.926(0.000)***	0.955(0.000)***	0.985(0.000)***	0.954(0.000)***
Exchange rate (log)	0.362(0.000)***	0.304(0.000)***	0.242(0.000)***	0.303(0.000)***
Deposit supply				
Constant	0.018(0.471)	0.012(0.646)	0.017(0.531)	0.019(0.528)
Real bank reserves (log)	0.471(0.000)***	0.474(0.000)****	0.700(0.000)***	0.665(0.000)***
Repo rate	-1.466(0.000)***	-1.842(0.000)***	-1.743(0.000)***	-1.714(0.000)***
Exchange rate (log)	1.260(0.000)***	0.897(0.000)***	0.953(0.000)***	0.965(0.000)****
	0.469(0.000)***	-0.180(0.080)*	-1.205(0.000)***	0.487(0.000)***
Repo rate*	0.349(0.000)***	-2.514(0.056)*	-0.544(0.750)	0.024(0.969)
Sample size	37 banks, 8 years	37 banks, 8 years	37 banks, 8 years	37 banks, 8 years

Notes: The results are estimated as one system with Table 16. The R-square for the deposit demand equations are: 0.8539 (size), 0.8079 (liquidity), 7267 (capital) and 0.8003 (foreign-ownership). The R-square for the deposit supply equations are: 0.9863 (size), 0.9809 (liquidity), 9795 (capital) and 0.9720 (foreign-ownership).

Effect of monetary policy on bank loans

Bank size

Table 12 presents the results when bank size is used to segregate banks. Demand for credit is generally in line with economic theory. What is unique is that credit demand

is lending rate–insensitive, which reduces the potency of the interest rate channel of monetary policy transmission. This could be attributed to weak legal and institutional structures for the enforcement of debt contracts, making interest rates sticky downwards.

Table 12: EC3SLS results for demand and supply of credit using bank asset size

	Small banks (Assets<Ksh 5 billions)	Medium banks Ksh 5 billions <Assets<=Ksh 15 billions)	Large banks Assets>Ksh 15 billions
Credit demand			
Constant	2.1e-08(1.000)	0.011(0.892)	-8.5e-09(1.000)
Lending rate	-0.196(0.785)	-1.076(0.066)*	-1.512(0.247)
Real GDP(log)	0.249(0.000)***	1.310(0.000)***	0.308(0.000)***
HHI(log)	0.791(0.000)***	-0.195(0.000)***	0.789(0.000)***
Credit supply			
Constant	0.002(0.933)	0.040(0.352)	0.002(0.950)
Real deposits(log)	0.395(0.000)***	0.972(0.000)***	0.725(0.000)***
Lending rate	0.458(0.372)	0.726(0.207)	0.344(0.718)
HHI(log)	0.589(.000)***	-0.119(0.028)**	0.267(0.000)***
Real non-interest income (log)	0.125(0.000)***	-0.084(0.016)**	0.136(0.000)***
Sample size	19 banks, 8 years	7 banks, 8 years	11 banks, 8 years

Notes: These results are estimated as a single system with those in Table 7. The R-square for the credit demand equation are: 0.9298 (small banks), 0.9782 (medium size) and 0.9879 (large banks). The R-square for the credit supply equation are: 0.9814 (small banks), 0.7665 (medium size) and 0.9956 (large banks).

Credit supply is the main focus in the BLC. We use two criteria in returning a verdict for the existence of BLC: real deposit and lending rate. First, the coefficients of the deposits in the credit supply equation are positive, meaning that bank loans depend on deposit mobilization. However, the deposits coefficient is higher for large banks compared to small banks. This is evidence against the existence of a BLC based on bank size. Second, the coefficient for the lending rate in the credit supply equation is positive as expected but is statistically insignificant, thus limiting the interest rate transmission channel. However, it is smaller for large banks than for small banks, as expected in a BLC. Third, competition proxied by the Herfindahl index is positively related to credit supply, which is contrary to expectation. Finally, the non-interest income (fees and commissions, foreign exchange trading and dividends) is generally complementary to credit supply, except for the medium-sized banks. However, the magnitude of the coefficient is slightly larger than for small banks. This is attributed to the fact that large banks derive, on average, 31.2% of their total income from non-interest sources compared to 24.4% for small banks (Table 6).

The results in Table 12 could be influenced by the difference in the sample sizes. Table 16 presents the results when the same sample size and interaction terms are used. Using the real deposit criterion, the "conditional effect" of the real deposit on bank credit is 0.447+0.035*size. This coefficient is more positive for large banks than for small banks,

confirming the results in Table 12. Using the lending rate criterion, the "conditional effect" of the lending rate is -1.292+1.015*size. This coefficient is positive and smaller for large banks than for small banks, confirming the results in Table 12. This is strong evidence against the existence of a BLC based on bank size in Kenya.

The results are contrary to the finding in Kashyap and Stein (1995) for the US. The reason for the difference is that large banks in Kenya use aggressive asset liability management (ALM) strategy as they seek to increase net interest income by maintaining a "negative shilling gap" (the difference between shilling interest rate-sensitive assets and shilling interest rate-sensitive liabilities).

Bank liquidity

Table 13 presents the results when liquidity is used to segregate banks. The demand for credit is generally in line with economic theory. However, it is lending rate insensitive, implying a reduced role for the interest rate channel. We use two criteria in returning a verdict regarding the BLC: the real deposit and lending rate. With regard to the deposit criterion, the credit for the low-liquid banks is more dependent on deposits than for high-liquid banks, as expected in a BLC. With regard to the lending rate criterion, we find the same results: the slope coefficient for credit supply is lower for low-liquid banks than for high-liquid banks as expected in a BLC. The effect of competition, proxied by the Herfindahl index, is positive, implying that credit supply increases with less competition contrary to expectation. We also find that the coefficient for the non-interest income is positive except for medium-liquid banks. The results in Table 13 are not confirmed by the interaction terms in Table 16 because the coefficient of the interaction terms is statistically insignificant.

Table 13: EC3SLS results using bank liquidity

	Low-liquidity (Ratio<38%)	Medium-liquidity (Ratio 38%-54%)	High-liquidity (Ratio>54%)
Credit demand			
Constant	4.3e-09(1.000)	-4.2e-08(1.000)	-2.8e-09(1.000)
Lending rate	-0.527(0.678)	-1.467(0.028)**	0.776(0.364)
Real GDP(log)	0.555(0.000)***	0.999(0.000)***	0.369(0.000)***
HHI(log)	0.699(0.000)***	-0.178(0.002)***	0.637(0.000)***
Credit supply			
Constant	-0.063(0.115)	0.029(0.476)	-0.005(0.873)
Real deposits(log)	0.611(0.000)***	-0.245(0.020)**	0.417(0.000)***
Lending rate	0.369(0.003)	1.253(0.000)***	0.566(0.000)***
HHI(log)	0.051(.000)***	-0.027(0.038)**	0.011(0.068)*
Real non-interest income (log)	0.458(0.000)***	-0.299(0.001)***	0.076(0.098)*
Sample size	12 banks, 8 years	13 banks, 8 years	12 banks, 8 years

Notes: These results are estimated as a single system with those in Table 8. The R-square for the credit demand equation are: 0.9565 (low-liquid), 0.9522 (medium liquid) and 0.7807 (high-liquid). The R-square for the credit supply equation are: 0.9935 (low liquid), 0.9895 (medium-liquid) and 0.9753 (high-liquid).

The results are in line with those found in Loupias et al. (2002) for France, Bondt (1998) for Europe and Kashyap and Stein (2000) for the US. The results are attributed to the fact that low-liquid banks in Kenya use an aggressive ALM strategy, in which they seek to increase net interest income by maintaining a "negative shilling gap" (the difference between shilling interest rate-sensitive assets and shilling interest rate-sensitive liabilities).

Bank capitalization

The results are presented in Table 14. The credit demand depends on income and competition. The lending rate has no effect on credit demand. We use two criteria in returning a verdict regarding the BLC: the real deposit and lending rate. With regard to the deposit criterion, we find that the credit for the high-capital banks is more dependent on deposits than that of low-capital banks, contrary to BLC. With regard to the lending rate criterion, the credit supply for high-capital banks is flatter than for low-capital banks, contrary to BLC.

The results in Table 14 could be influenced by the difference in the sample sizes. Table 16 presents the results when the same sample size and interaction terms are used. Using the real deposit criterion, the "conditional effect" of the real deposit on bank credit is 0.560-0.354*capital. This coefficient is more positive for low-capital banks than for high-capital banks. The lending rate criterion is not used due to the statistical insignificance of the coefficient of the interaction term. This confirms the existence of a BLC based on bank capital. The results are consistent with the finding by Altunbas et al. (2002) for Europe, Kishan and Opiela (2000; 2006) for the US, Farinha and Marques (2001) for Portugal, Gambocorta and Mistrulli (2004) for Italy, and Sichei (2005) for South Africa.

Table 14: EC3SLS results using bank total capital to risk-weighted assets ratio

Deposit demand	Low-capital (Ratio<19%) Statutory=12%	Medium-capital (Ratio 19%-28%) Statutory=12%	High-capital (Ratio>28%) Statutory=12%
Credit demand			
Constant	-0.079(0.347)	3.4e-08(1.000)	-5.9e-08(1.000)
Lending rate	1.507(0.185)	-0.539(0.582)	0.242(0.780)
Real GDP(log)	0.641(0.000)***	0.752(0.000)***	0.475(0.000)***
HHI(log)	0.666(0.000)***	0.351(0.002)***	0.518(0.000)***
Credit supply			
Constant	-0.006(0.689)	0.027(0.482)	-0.016(0.608)
Real deposits(log)	0.250(0.003)***	0.025(0.689)	0.467(0.000)***
Lending rate	0.727(0.000)	0.946(0.000)***	0.515(0.000)***
HHI(log)	0.003(0.358)	0.030(0.076)*	0.021(0.014)**
Real non-interest income (log)	0.159(0.005)***	0.031(0.490)	0.142(0.000)***
Sample size	14 banks, 8 years	10 banks, 8 years	13 banks, 8 years

Notes: These results are estimated as a single system with those in Table 9. The R-square for the credit demand equation are: 0.9807 (low-capital), 0.9711 (medium-capital) and 0.9414 (high-capital). The R-square for the credit supply equation are: 0.9975 (low-capital), 0.9919 (medium-capital) and 0.9777 (high-capital).

Foreign bank ownership

Table 15 presents the results when foreign-ownership is used to segregate banks. We use two criteria in returning a verdict regarding BLC: the real deposit, and lending rate. With regard to the deposit criterion, the credit for the foreign-owned banks is more dependent on deposits than for domestic-owned banks, contrary to BLC. With regard to the lending rate criterion, credit for domestic-owned banks responds more to changes in the lending rate. Competition, proxied by the Herfindahl index, is positive for domestic-owned banks but negative for foreign-owned banks. The non-interest income is complementary for domestic-owned banks but is a substitute for foreign-owned banks.

The results in Table 15 could be influenced by the difference in the sample sizes. Table 16 presents the results when the same sample size and interaction terms are used. Using the real deposit criterion, the "conditional effect" of the real deposit on bank credit is 0.618+0.128*ownership. This coefficient is more positive for foreign-owned banks than for domestic-owned banks. The "conditional effect" of the lending rate is 1.117-2.158*ownership. This coefficient is lower (credit supply flatter) for foreign-owned banks than domestic-owned banks. This is strong evidence against BLC based on foreign-ownership. The results are contrary to the finding by Ashcraft (2006) for the US, in which stand-alone banks are affected more by monetary policy.

Table 15: EC3SLS results using foreign-bank ownership dummy

	Domestic-owned banks	Foreign-owned banks
Credit demand		
Constant	1.5e-08(1.000)	2.4e-08(1.000)
Lending rate	-0.315(0.712)	2.669(0.024)**
Real GDP(log)	0.449(0.000)***	0.646(0.000)***
HHI(log)	0.695(0.000)***	0.492(0.000)***
Credit supply		
Constant	0.002(0.933)	0.016(0.676)
Real deposits(log)	0.561(0.000)***	1.126(0.000)***
Lending rate	1.612(0.006)***	-0.069(0.888)
HHI(log)	0.397(0.000)***	-0.207(0.000)***
Real non-interest income (log)	0.214(0.000)***	-0.144(0.000)***
Sample size	27 banks, 8 years	10 banks, 8 years

Notes: Results estimated as a single system with Table 10. The R-square for the credit demand equation are: 0.9181 (domestic-owned) and 0.9615 (foreign-owned). The R-square for the credit supply equation are: 0.9898 (domestic-owned) and 0.9771 (foreign-owned).

Table 16: EC3SLS results for credit demand and supply (equations 4 and 12)

Credit demand	Size (z_{it} = *size*)	Liquidity (z_{it} = *liquidity*)	Capital (z_{it} = *capital*)	Foreign-ownership (z_{it} = *foreign ownership*)
Constant	-2.1e-05(0.999)	-0.001(0.984)	0.001(0.973)	0.001(0.971)
Lending rate	-1.198(0.126)	0.869(0.218)	-0.175(0.000)***	-0.043(0.938)
Real GDP (log)	0.727(0.000)***	0.732(0.000)***	0.713(0.000)***	0.668(0.000)***

Continued on next page

Table 16 Continued

Credit demand	Size (z_{it} = *size*)	Liquidity (z_{it} = *liquidity*)	Capital (z_{it} = *capital*)	Foreign-ownership (z_{it} = *foreign ownership*)
HHI (log)	0.445(0.000)***	0.396(0.000)***	0.437(0.000)***	0.482(0.000)***
Credit supply				
Constant	0.003(0.800)	0.004(0.784)	0.003(0.848)	0.002(0.897)
Real deposits (log)	0.447(0.000)***	0.598(0.000)****	0.560(0.000)***	0.618(0.000)***
Lending rate	-1.292(0.000)***	-0.185(0.589)	0.183(0.663)	1.111(0.071)*
HHI (log)	0.617(0.000)***	0.421(0.000)***	0.428(0.000)***	0.354(0.000)****
Real NII(log)	0.109(0.000)***	0.101(0.000)***	0.165(0.000)***	0.179(0.000)***
	-0.017(0.845)	-1.299(0.000)***	1.752(0.000)***	-1.208(0.000)***
Deposits (log)*	0.035(0.000)***	0.036(0.124)	-0.354(0.000)***	0.128(0.000)***
Lending rate*	1.015(0.000)***	0.114(0.880)	-1.463(0.305)	-2.158(0.004)***
Sample size	37 banks, 8 years	37 banks, 8 years	37 banks, 8 years	37 banks, 8 years

Notes: The results are estimated as one system with Table 11. The R-square for the credit demand equations are: 0.8937 (size), 0.9342 (liquidity), 7145 (capital) and 0.7554 (foreign-ownership). The R-square for the credit supply equations are: 0.9817 (size), 0.9802 (liquidity), 9867 (capital) and 0.9839 (foreign-ownership).

Contextualisation of the results

BLC based on bank size

Table 17 presents the summary of the results. The monetary policy of the CBK influences the deposit mobilization of small banks more than large banks as expected in a BLC. This is attributed to three factors in Kenya: small banks are perceived by customers as less "stable and secure"; there is inadequate coverage of the deposits by the DPF; and the inter-bank market is skewed in favour of large banks. Thus, big banks have a high cost of interest funds (e.g. the high interest expense on customer deposits in Table 6). One would naturally expect the loans of small banks to be dependent on bank deposits and be more responsive to changes in the lending rates than those of large banks. However, as shown in Table 17, loans of small banks are affected less by monetary policy (less dependent on deposits and less flat credit supply) than those of large banks, contrary to BLC. The reason is that small banks are able to shield their loans against monetary policy shocks by pursuing a defensive/conservative ALM strategy: less loans-assets ratio, and charging high lending rates (Table 5). On the contrary, large banks with lower cost of funds follow an aggressive ALM strategy, for example, high loan-asset ratio (Table 5). This leaves them exposed to monetary policy shocks, thus leading to the failure of a BLC to exist in Kenya based on bank size.

BLC based on liquidity

Table 17 presents the summary of the results. The monetary policy of the CBK influences the deposit mobilization of high-liquid banks more than low-liquid banks, contrary to BLC. This is attributed to three factors in Kenya: high-liquid banks are generally small

banks perceived by customers as less "stable and secure"; there is inadequate coverage of the deposits by the DPF; and the inter-bank market is skewed in favour of low-liquid banks, which are generally large and perceived as more "stable and secure" (too-big-to-fail). Thus, they have a high cost of interest funds (e.g. high interest expense on customer deposits, as shown in Table 6). One would naturally expect the loans of high-liquid banks to be dependent on bank deposits and be more responsive to changes in the lending rates than those of low-liquid banks. However, as shown in Table 17, the loans of high-liquid banks are affected less by monetary policy than those of low-liquid banks, in line with BLC. The reason is that high-liquid banks are able to shield their loan portfolio against monetary policy shocks by pursuing a defensive/conservative ALM strategy; for example a lower loan-asset ratio (Table 5). On the contrary, low-liquid banks follow an aggressive ALM strategy: for example a high loan-asset ratio (Table 5). This makes them exposed to monetary policy shocks, thus leading to the existence of a BLC in Kenya based on bank liquidity. The results are in line with the finding of Kashyap and Stein (2000).

BLC based on capitalization

Table 17 presents the summary of the results. The monetary policy of the CBK influences the deposit mobilization of high-capital banks more than low-capital banks, contrary to BLC. This is attributed to three factors in Kenya: high-capital banks are generally small banks in size, and perceived by customers as less "stable and secure"; there is inadequate coverage of the deposits by the DPF; and inter-bank market is skewed in favour of large low-capital banks, which are generally large and perceived as more "stable and secure" (too-big-to-fail). Thus, they have a high cost of interest funds. One would naturally expect the loans of high-capital banks to be dependent on bank deposits and be more responsive to changes in the lending rates than those of low-capital banks. This would imply the existence of a "bank capital channel" of monetary policy transmission. However, as shown in Table 17, the loans of high-capital banks are affected less by monetary policy than for low-capital banks. This is strong evidence in favour of the existence of a BLC and non-existence of a "bank capital channel" of MTM in Kenya. The reason is that high-capital banks are able to shield their loan portfolio from monetary policy shocks by pursuing a defensive/conservative ALM strategy: lower loan-asset ratio (Table 5). On the contrary, low-capital banks follow an aggressive ALM strategy: for example a high loans-asset ratio (Table 5), which makes them exposed to monetary policy shocks, thus leading to the existence of a BLC in Kenya based on capital. The results are in line with Kishan and Opiela (2000; 2006) and Gambacorta and Mistrulli (2004).

BLC based on foreign-ownership (significant foreign-affiliation)

Table 17 presents the summary of the results. The monetary policy of the CBK influences the deposit mobilization of high-capital banks more than low-capital banks contrary to BLC. This is attributed to three factors in Kenya: domestic-owned banks are generally small banks in size, and are perceived by customers as less "stable and secure"; there is inadequate coverage of the deposits by the DPF; and the inter-bank market is skewed in favour of foreign-owned banks, which are generally large and perceived at more "stable and secure" (too-big-to-fail and have "foreign support" in the event of failure).

Table 17: Summary of results and contextualization in Kenya

Bank characteristic	Monetary policy and deposit mobilization		Monetary policy and bank loans (ultimate deciding factor about BLC)	
	Funding	Justification	Decision on BLC	Justification/mitigating factors
Size	Deposits of small banks hit most by monetary policy (BLC exists)	(i) Small banks perceived as less "stable and secure" (ii) Incomplete coverage of deposits by DPF (iii) High costs of funds of small funds (iv) Inter-bank market favours large banks	Loans of large banks hit most by monetary policy (BLC does not exist)	(i) Small banks follow defensive ALM strategy, cutting off BLC (ii) Large banks follow aggressive ALM strategy, exposing themselves to monetary policy shocks
Liquidity	Deposits of high-liquid banks hit most by monetary policy (BLC does not exist)	(i) Have high cost of funds (ii) Generally, small banks perceived as less "stable and secure" (iii) Incomplete coverage of DPF	Loans of low-liquid banks hit most by monetary policy (BLC exists)	(i) Low-liquid banks follow aggressive ALM, exposing themselves to monetary policy shocks (ii) High-liquid banks follow defensive ALM strategy, cutting off BLC
Capital	Deposits of high-capital banks hit most by monetary policy	(i) Have high cost of funds (ii) Generally small banks perceived as less "stable and secure"	Loans of low-capital banks hit most by monetary policy (BLC exists)	(i) Low-capital banks follow aggressive ALM strategy, exposing them to monetary policy shocks (ii) High-capital banks follow defensive ALM, cutting off BLC
Ownership	Deposits of domestic-owned banks hit most by monetary policy	(i) Incomplete coverage of deposits by DPF (ii) Domestic-owned banks less "stable and secure"	Loans of foreign-owned banks hit most by monetary policy (BLC does not exist)	(i) Domestic-owned banks follow aggressive ALM strategy, exposing them to monetary policy shocks (ii) Foreign-owned banks follow defensive ALM strategy, cutting off BLC

Thus, foreign-owned banks have a low cost of interest funds. One would naturally expect the loans of domestic-owned banks to be more dependent on bank deposits and credit supply to be flatter than for foreign-owned banks (strong BLC). However, as shown in Table 17, the loans of foreign-owned banks are affected more by monetary policy than those of domestic-owned banks. This is evidence against the existence of a BLC. The reason is that foreign-owned banks have the skill and expertise to monitor and manage financial risks such as interest rate (pricing difference between loans and deposits), credit risk (probability of default), and liquidity risk (when loans and deposits have different maturities). They also have more balanced sources of income compared to domestic-owned banks (Table 6). This is done through a conservative yet dynamic ALM strategy that enables them to maintain a mix of loans and deposits consistent with set goals of long-term growth and risk management. This makes their assets and liabilities very sensitive to monetary policy shocks, compared to domestic-owned banks.

How significant is BLC in Kenya?

BLC exists in Kenya based on liquidity and capitalization. First, banks with less liquid balance sheets are affected more by monetary policy. Second, banks with less total capital to risk-weighted assets ratio are affected more by monetary policy than those with high total capital to risk-weighted assets ratio. In view of the fact that less liquid and less capital banks are generally the large banks, contributing about 82% of the total bank loans in Kenya, the BLC of MTM is significant. With lending-rate insensitive credit demand, the BLC plays a significant role in complementing the weak interest rate channel.

6. Conclusions and policy recommendations

The aim of this study was to check the possible existence of a BLC in Kenya during the period 2001 to 2008. Our premise has been that to provide a sharp test of the bank lending channel, one has to estimate directly a system of "structural" money and credit market equations, allowing for asymmetries in loan supply across banks depending on their asset size, liquidity, capitalization and ownership.

We use bank-level annual panel data for the period 2001 to 2008 and our main conclusion is that a BLC exists in Kenya based on bank liquidity and capital. First, there are a number of individuals and firms who are bank-dependent due to the imperfect capital market. Second, monetary policy has a stronger effect on the loans of banks with less liquid balance sheets than on those with highly liquid balance sheets. Third, the loans of banks with low total capital to risk-weighted assets ratios are hit more by monetary policy compared to banks with high capital ratio. Finally, we find that BLC is significant in Kenya, since it affects large banks, which contribute about 82% of total credit.

The study also finds that credit demand is lending rate-insensitive for all categories of banks, which limits the possibility of the existence of an interest rate channel, which should be reinforced by the BLC. This is attributed to the deficiencies in the legal and institutional structure, which hamper the enforcement of debt contracts, such as inefficiencies and corruption in the system of land registration, and delays in court process. These undermine property and creditor rights. In such an environment, banks require high levels of collateral and add a high credit risk premium to their base lending rates.

The finding of a BLC implies a number of issues in Kenya. First, monetary policy can have effects on investment and aggregate activity without affecting interest rates. This means that interest rates are not the only measures to gauge the stance of monetary policy, which has implications on modelling investment functions in Kenya. Second, the quantitative impact of the BLC in Kenya is sensitive to a number of institutional characteristics (i.e. liquidity and capitalization) of the financial market, which can be used to gauge the strength and distribution of monetary policy. Third, prudential bank regulation, particularly the liquidity and capitalization, should be harmonized with monetary policy. For instance, the implementation of Basel II requirements in Kenya will have implications on monetary policy. Under the current framework, banks operating on lower capital ratios are affected most by monetary policy as expected in the BLC.

However, implementation of Basel II may create a situation where banks with high capital ratios are less affected by monetary policy ("bank capital channel"). Therefore, increasing capital requirements may lead to a more sound banking system, but can lead to a banking system that is less responsive to monetary policy. There is therefore need to balance regulatory and stabilization policies. Fourth, the effects of monetary policy on borrowers and banks are asymmetric in Kenya. Fifth, bank credit can be used as a nominal anchor (intermediate target) for monetary policy and a leading indicator for economic activity in Kenya. Finally, the presence of a BLC implies the existence of a socially inefficient allocation of scarce resources, since the most profitable investment might be denied funding by banks. This is in sharp contrast to the traditional textbook interest rate channel, where only the least socially productive investment projects remain unfunded after monetary policy contraction (Cecchetti, 1995).

Notes

1. This depends on the monetary policy framework.

2. The HHI measures market concentration based on the sum of squared market shares of individual banks. The upper value of the index is 10,000, which corresponds to a monopoly. The lower bound is zero, corresponding to a competitive market with no dominant player. A HHI below 1,000 indicates an unconcentrated industry. A HHI between 1,000 and 1,800 indicates moderate concentration, while a HHI above 1,800 indicates high concentration.

3. This uses "semi-structural VAR" innovations to determine overall stance of monetary policy.

4. The usage of "cash-in-till" here follows central banking definition; i.e. sum of cash in commercial bank safe (vaults) and cashiers' tills. This is slightly different from commercial banking definition where "cash-in-till" only refers to the cashiers' tills, whereas the cash in the safe is referred to as reserve cash.

5. This is the classification used by the Bank Supervision Department of the Central Bank of Kenya.

6. Within the study period, CBK varied the cash ratio requirement three times. It is also worth noting that the repo rate used as a proxy of monetary policy stance varied every year within the study period.

7. Banks consider the 182-day Treasury bill rate before bidding in the repo market. Inclusion of the 182-day Treasury bill rate led to very high coefficients for it and the repo rate.

References

Altunbas, Y., Fazylov, O. and P. Molyneux. 2002. "Evidence on bank lending channel in Europe". Journal of Banking and Finance, 26: 2093-2110.

Arango, S. and M.I. Nadiri. 1981. "Demand for money in open economies", Journal of Monetary Economics, 7:69-83.

Ashcraft, A.B. 2006. "New evidence on lending channel". Journal of Money, Credit and Banking, 38(3): 751-775.

Baltagi, B.H. 1981. "Simultaneous equations with error components". Journal of Econometric, 17:21-49.

Baltagi, B.H. 2008. *Econometric analysis of panel data.* Fourth edition. New York: John Wiley.

Baltagi, B.H. 2009. *A companion to econometric analysis of panel data*. New York: John Wiley.

Baltensperger, E. 1978. "Credit rationing: issues and questions". American Economic Review, 10 (2): 170-183.

Bester, H. 1985. "Screening vs rationing in credit markets with imperfect information". American Economic Review, 75(4): 850-855.

Bernanke, B.S. and A. Blinder. 1988. "Credit, money and aggregate demand". The American Economic Review, 78:435-439.

Bernanke, B.S. and A. Blinder. 1992. "The federal funds rate and the channels of monetary transmission". American Economic Review, 82:901-21.

Bernanke, B.S. and M. Gertler. 1995. "Inside the black box: The credit channel of monetary policy". Journal of Economic Perspectives, 9(4): 27-48.

Bernanke, B.S. and I. Mihov. 1995. "Measuring monetary policy", The Quarterly Journal of Economics, 113(3): 869-902.

Bondt, G.J. de. 1998. "Credit channels in Europe: Bank level panel data analyses". Research Memorandum nr 543/9813. De Nederlandsche bank NV.

Caprio, G. and Demirguc-Kunt A. 1997. "The role of long term finance: Theory and evidence", Policy Research Paper No. 1746. Policy Research Department. Washington DC: World Bank.

Carpenter, R., Fazzari, S. M. and Petersen, B. 1995. "Three financing constraint hypotheses and inventory investment: New tests with time and sectoral heterogeneity". Economics Working Paper Archive Macroeconomics Series No. 9510001.

Cecchetti, S. 1995. "Distinguishing theories of monetary policy transmission mechanism". Federal Reserve Bank of St. Louis, 77:83-97.

Central Bank of Kenya. 2006. *Prudential guidelines for institutions licensed under the Banking Act*. Nairobi: Central Bank of Kenya.

Cheng, K.C. 2006. "A VAR analysis of Kenya's monetary policy transmission mechanism: How does the Central Bank repo rate affect the economy?". Working Paper Series No.WP/06/300. Washington DC: International Monetary Fund.

Edwards, F. and Mishkin, F.S. 1995. "The decline of traditional banking: Implications for financial stability and regulatory policy". Federal Reserve Bank of New York Economic Policy Review, 1(2): 27-45.

Fama, E.F. 1990. "Contracting costs and financing decisions". Journal of Business, 63(1): S71-S91.

Farinha, L. and Marques, C.R. 2001. "The bank lending channel of monetary policy: Identification and estimation using Portuguese micro bank data". Working Paper No.102. Frankfurt: European Central Bank.

Gambacorta, L. and P.E. Mistrulli. 2004. "Does bank capital affect lending behaviour?" Journal of Financial Intermediation, 13: 436-457.

Grossman, S. and L. Weiss. 1983. "A transaction-based model of monetary transmission mechanism". American Economic Review, 73(5): 871-880.

Hadri, K. 2000. "Testing for stationarity in heterogenous panels". Econometrics Journal 3:148-161.

HM Treasury, UK. 2003. EMU and monetary transmission mechanism. At http://www.hm-treasury.gov.uk/d/adhamp03_123_319.pdf, accessed on 30/10/2009

Huang, Z. 2003. "Evidence of a bank lending channel in the UK". Journal of Banking and Finance, 27:491-510.

Im, K.S., M.H. Pesaran and Y. Shin. 2003. "Testing for unit roots in heterogenous panels". Journal of Econometrics, 115:53-74.

Jaffe, D. and T. Russel. 1976. "Imperfect information, uncertainty and credit rationing". Journal of Economics, 90:651-666.

Kao, C.1999. "Spurious regression and residual-based tests for cointegration in panel data". Journal of Econometrics, 90:1-44.

Kashyap, A.K. and J.C. Stein. 1994. *Monetary policy and bank lending. Chicago:* Chicago University Press.

Kashyap, A.K. and J.C. Stein. 1995. "The impact of monetary policy on bank balance sheets". Carnegie Rockester Conference Series on Public Policy, 42: 151-95.

Kashyap, A.K. and J.C. Stein. 2000. "What do a million observations on banks say about the transmission of monetary policy?" American Economic Review, 90: 407-428.

Kishan, R. P. and R.P. Opiela. 2000. "Bank size, bank capital, and the bank lending channel". Journal of Money, Credit and Banking, 32: 121-141.

Kishan, R. P. and R.P. Opiela. 2006. "Bank capital and loan supply asymmetry in the transmission of monetary policy". Journal of Banking and Finance, 30: 259-285.

Levin, A., C.F. Lin and C. Chu. 2002. "Unit root test in panel data: Asymptotic and finite sample properties". Journal of Econometrics, 108:1-24.

Loupias, C., Savignac, F. and P. Sevestre. 2002. "Is there a bank lending channel in France?: Evidence from bank panel data". Working Paper 92. Banque de France.

Ludi, K.L. and M. Ground. 2006. "Investigating the bank-lending channel in South Africa: A VAR approach". Working Paper Series No. 2006-4. Department of Economics, University of Pretoria. At http://www.up.ac.za/up/web/en/academic/economics/Research/wps.html.

Mishkin, F.S. 1995. "Symposium on the monetary transmission mechanism". Journal of Economic Perspectives, 9(4): 3-10.

Opiela, T.P. 2007. "Differential deposit guarantees and the effect of monetary policy on bank lending". Economic Inquiry, 46(4): 610-623.

Pedroni, P. 2004. "Panel cointegration: Asymptotic and finite sample properties of pooled time series tests with application to the PPP hypothesis". Econometric Theory 20:597-625.

Rotemberg, J. 1984. "A monetary equilibrium model with transactions costs", Journal of Political Economy, 92(1):40-58.

Peek, J. and E. Rosengren. 1995. "The capital crunch: Neither a borrower nor a lender be", Journal of Money, Credit and Banking, 27(3):626-638.

Sharpe, S. 1990. "Asymmetric information, bank lending and implicit contracts: A stylised model of customer relationships," Journal of Finance, 45: 1069-1087.

Sichei, M.M. 2005. "Bank-lending channel in South Africa: Bank-level dynamic panel data analysis". Working Paper Series No. 2005-10. Department of Economics, University of Pretoria. At http://www.up.ac.za/up/web/en/academic/economics/Research/wps.html

Stiglitz, J. and A. Weiss. 1981. "Credit rationing in markets with imperfect information". American Economic Review, 71: 393-410.

Walsch, C.E. 2010. *The monetary theory and policy.* Third Edition. MIT: MIT Press.

World Bank, KIPPRA and CSAE, Oxford. 2004. Enhancing the competitiveness of Kenya's manufacturing sector: The role of the investment climate. Regional Program for Enterprise Development.

Worms, A. 2001. "The reaction of bank lending to monetary policy measures in Germany". Working Paper No. 96. Frankfurt: European Central Bank.

Appendixes

A. Procedures for performing EC3SLS

The system of structural equation can be written in matrix form in equation

$$y = Z\,\delta + \varepsilon \tag{A1}$$

Where

$$y = \begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \end{bmatrix} = \begin{bmatrix} \ln\left(\frac{D}{P}\right)^{d}_{it} \\ \ln\left(\frac{D}{P}\right)^{s}_{it} \\ \ln\left(\frac{C}{P}\right)^{d}_{it} \\ \ln\left(\frac{C}{P}\right)^{s}_{it} \end{bmatrix}, \; Z_j = \left\lfloor Y_j, X_j \right\rfloor, \; Z = diag\; Z_j = \begin{bmatrix} Z_1 & 0 & 0 & 0 \\ 0 & Z_2 & 0 & 0 \\ 0 & 0 & Z_3 & 0 \\ 0 & 0 & 0 & Z_4 \end{bmatrix}$$

and

$$Diag \quad Z_1 = \left(i^{tb}_t, i^{d}_{it}, \ln y_t\right), \; Diag\; Z_2 = \left(i^{tb}_t, \ln\left(\frac{R}{P}\right)_{it}, r_t, \ln e_t\right),$$

$$Diag \quad Z_3 = \left(lr_{it}, \ln y_{it}, \ln HI_t\right), \text{ and } Diag\; Z_4 = \left(\ln\left(\frac{D}{P}\right)_{it}, lr_{it}, \ln HI_t, \ln NI_{it}\right)$$

$$y = \begin{bmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ \delta_4 \end{bmatrix} = \begin{bmatrix} \beta_{10}, \beta_{11}, \gamma_{11}, \gamma_{12} \\ \beta_{20}, \beta_{21}, \gamma_{21}, \gamma_{22}, \gamma_{23} \\ \beta_{30}, \beta_{31}, \gamma_{31}, \gamma_{32} \\ \beta_{40}, \beta_{41}, \beta_{42}, \gamma_{41}, \gamma_{42} \end{bmatrix}, \varepsilon = \begin{bmatrix} \varepsilon_{1it} \\ \varepsilon_{2it} \\ \varepsilon_{3it} \\ \varepsilon_{4it} \end{bmatrix} = \begin{bmatrix} \mu_{1i} + v_{1it} \\ \mu_{2i} + v_{2it} \\ \mu_{3i} + v_{3it} \\ \mu_{4i} + v_{4it} \end{bmatrix}$$

The endogenous variables' coefficients use β_{ij} and exogenous variables' coefficients use γ_{ij}.

The procedure used is as follows:

(i) Obtain within two stage least squares (W2SLS) and between two stage least squares (B2SLS) estimates of each of the four structural equations. It is imperative to note that the equation for the credit supply depends on what is being analysed.

(ii) Compute estimates of the error-covariance matrices of the W2SLS ($\hat{\sum}_v$) and B2SLS ($\hat{\sum}_1$) using residuals from step (i) between:

$$\hat{\sum}_1 = \sigma_{1jl}^2 = \frac{\left(y_j - \tilde{Z_j}\delta_{j,B2SIS}\right)' P\left(y_l - Z_l\hat{\delta}_{l,B2SIS}\right)}{N} \quad \text{(A2)}$$

and L

$$\hat{\sum}_v = \sigma_{vjl}^2 = \frac{\left(y_j - Z_j\tilde{\delta}_{j,W2SIS}\right)' Q\left(y_l - Z_l\hat{\delta}_{l,W2SIS}\right)}{N(T-1)} \quad \text{(A3)}$$

Where P is $NT \times NT$ averaging matrix computed as $P = Z_\mu(Z'_\mu Z_\mu)^{-1}Z_\mu$. Z_μ is $NT \times N$ selector matrix of ones and zeros showing bank specific dummies. Q is $NT \times NT$ demeaning matrix computed as $Q = I_{NT} - P$. Note that $\hat{\sum}_1$ and $\hat{\sum}_v$ are both 4×4 matrices.

(iii) Compute the matrix:

$$\hat{\sum}_\mu = \frac{\left(\hat{\sum}_1 - \hat{\sum}_\mu\right)}{T} \quad \text{(A4)}$$

(iv) Check if the matrix in A4 is positive definite or not (i.e. the Eigen values are all positive). Analysis proceeds if the matrix is positive definite. The use of lagged dependent variables was rejected due to the failure of this condition.

(v) Compute the inverse of $\hat{\sum}_1$ and $\hat{\sum}_v$

(vi) Compute the Cholesky decomposition of $\hat{\sum}_1^{-1}$ and $\hat{\sum}_v^{-1}$ to get $\hat{\sum}_1^{-½}$ and $\sum_v^{-½}$

(vii) The modified spectral decomposition of the variance-covariance matrix for the set of 4 equations is:

$$\Omega^{-½} = \sum_1^{-½} \otimes P + \sum_v^{-½} \otimes Q \quad \text{(A5)}$$

where $\otimes$ is the Kronecker product

(viii) Transform equation A1 by pre-multiplying with A5 to generate A6:

$$y^* = Z^* \delta + u^* \quad \text{(A6)}$$

Where $y^* = \Omega^{-½} y$ $Z^* = \Omega^{-½} Z$, $u^* = \Omega^{-½} u$

(ix) Apply 3SLS to the transformed system using the optimal instruments $A = \left[I_4 \otimes \widetilde{X}, I_4 \otimes \overline{X} \right]$, where X is a matrix of exogenous variables. $\widetilde{X} = QX$ (i.e., demeaned X) and $\overline{X} = PX$ (mean of X).

B. Solutions for the deposit and credit market

Deposit market

$$\mu_0 = \frac{\beta_{20} - \beta_{10}}{\beta_{11} - \beta_{21}}, \mu_1 = \frac{\gamma_{21}}{\beta_{11} - \beta_{21}} < 0, \mu_2 = \frac{\gamma_{22}}{\beta_{11} - \beta_{21}} > 0, u_3 = \frac{-\gamma_{11}}{\beta_{11} - \beta_{21}} > 0,$$

$$\mu_4 = \frac{-\gamma_{12}}{\beta_{11} - \beta_{21}} > 0, \mu_5 = \frac{\gamma_{23}}{\beta_{11} - \beta_{21}} < 0.$$

$$\kappa_0 = \frac{\beta_{20}\beta_{11} - \beta_{21}\beta_{10}}{\beta_{11} - \beta_{21}}, \kappa_1 = \frac{\beta_{11}\gamma_{21}}{\beta_{11} - \beta_{21}} > 0, \kappa_2 = \frac{\gamma_{22}\beta_{11}}{\beta_{11} - \beta_{21}} < 0, \kappa_3 = \frac{\gamma_{11}\beta_{11}}{\beta_{11} - \beta_{21}} > 0,$$

$$\kappa_4 = \frac{-\gamma_{12}\beta_{21}}{\beta_{11} - \beta 1} > 0, \kappa_5 = \frac{\gamma_{23}}{\beta_{11} - \beta_{21}} < 0.$$

Credit market

$$\gamma_0 = \frac{\beta_{40} - \beta_{30}}{\beta_{31} - \beta_{42}}, \gamma_1 = \frac{\beta_{41}}{\beta_{31} - \beta_{42}} < 0, \gamma_2 = \frac{-\gamma_{31}}{\beta_{31} - \beta_{42}} > 0, \gamma_3 = \frac{\gamma_{41} - \gamma_{32}}{\beta_{31} - \beta_{42}} > 0,$$

$$\gamma_4 = \frac{\gamma_{42}}{\beta_{31} - \beta_{42}} > 0.$$

$$\rho_0 = \frac{\beta_{31}\beta_{40} - \beta_{42}\beta_{30}}{\beta_{31} - \beta_{42}}, \rho_1 = \frac{\beta_{31}\beta_{41}}{\beta_{31} - \beta_{42}} > 0, \rho_2 = \frac{-\gamma_{31}\beta_{42}}{\beta_{31} - \beta_{42}} < 0, \rho_3 = \frac{\gamma_{42}\beta_{31} - \gamma_{32}\beta_{42}}{\beta_{31} - \beta_{42}} > 0,$$

$$\rho_4 = \frac{\gamma_{42}\beta_{31}}{\beta_{31} - \beta_{42}} > 0.$$

Table A 1: Order and rank condition of identification

Equation	Order condition				Rank condition	
	K	M	G	Is K-M (G-1)?	Rank of J matrix. Is rank J 3?	
Deposit demand	11	4	4	Yes	3	Yes
Deposit supply	11	5	4	Yes	3	Yes
Credit demand	11	4	4	Yes	3	Yes
Credit supply	11	5	4	Yes	3	Yes

Note: G=total number of endogenous variables, K=total number of variables in the model (endogenous and pre-determined), M=number of variables (endogenous and pre-determined), in a particular equation, J=matrix constructed from the coefficients excluded from a particular equation, but contained in other equations of the model.

Table A 2: Panel unit root tests

Variable	IPS (2003) w-statistic Individual unit root	Hadri (2000) Individual stationarity	Conclusion
Real loans (log)	0.051(0.536)	31.045(0.000)***	Nonstationary
Real deposits (log)	0.059(0.476)	33.963(0.000)***	Nonstationary
Real GDP (log)	-1.079[0.140)	7.909(0.000)***	Nonstationary
182-day Treasury bill	0.848(0.802)	17.825(0.000)***	Nonstationary
Deposit rate	0.753(0.774)	29.363(0.000)***	Nonstationary
Lending rate	0.483(0.685)	33.584(0.000)***	Nonstationary
Repo	0.646(0.741)	17.463(0.000)***	Nonstationary
Real bank reserves (log)	-0.661(0.255)	44.321(0.000)***	Nonstationary

Continued on next page

Inflation rate	-3.951(0.000)***	-1.750(0.960)	Stationary
Nominal exchange rate (log)	-0.059(0.476)	63.081(0.000)***	Nonstationary
Cash ratio requirement	0.958(0.831)	17.286(0.000)***	Nonstationary
Real non-interest income (log)	-0.431(0.331)	43.520(0.000)***	Nonstationary
Herfindal index(log)	3.752(0.999)	41.121(0.000)***	Nonstationary

Table A 3: Panel cointegration tests

Equation	Pedroni residual test (Weighted ADF version) Null: No cointegration	Kao test residual-based test (ADF) Null: No cointegration
Deposit demand (Equation 2)	-6.327(0.000)***	-2.111(0.017)**
Deposit supply (Equation 3)	-6.836(0.000)***	-2.229(0.013)**
Credit demand (Equation 4)	-12.753(0.000)***	1.692(0.045)**
Credit supply (Equation 5)	-4.895(0.000)***	-2.554(0.005)**

Table A 4: Sectoral bank credit (%)

Industry	Small banks (Assets<Ksh5 billion)			Medium-sized banks (Ksh5 billion <Assets<=Ksh15 billion)			Large banks (Assets> Ksh15 billion)		
	2000	2004	2008	2000	2004	2008	2000	2004	2008
A. ENTERPRISES	**88.9**	**74.9**	**84.3**	**88.5**	**78.9**	**83.1**	**85.1**	**69.8**	**78.9**
Agriculture, Hunting, Fishing and Forestry	3.7	3.3	2.5	6.6	5.5	2.8	11.2	9.9	5.4
Mining and Quarrying	0.8	0.3	2.7	1.7	1.0	1.4	0.9	0.5	1.7
Manufacturing	16.9	15.9	12.6	22.3	21.2	17.4	23.7	17.6	14.0
Electricity and Water	0.3	0.3	0.6	1.7	2.3	1.0	0.4	0.3	0.9
Building and Construction	8.6	4.9	7.9	4.0	3.8	5.0	6.7	5.3	4.5
Wholesale and Retail Trade, Restaurants and Hotels	18.5	14.1	16.6	23.4	16.1	14.7	13.6	11.7	12.7
Transport and Communication	6.4	6.5	8.2	8.4	7.8	8.4	2.0	5.3	9.2
Finance and Insurance	2.6	3.1	2.0	1.2	2.3	1.9	2.1	2.1	3.0
Real Estate (commercial and residential)	8.4	3.6	6.0	4.3	2.1	5.4	2.9	2.6	3.2
Business Services (working capital and other)	10.7	5.6	14.7	9.3	6.9	12.9	10.8	7.4	10.7
Foreign Trade (imports, exports and re-exports)	3.6	2.4	4.2	2.9	3.0	3.4	3.9	0.7	2.4
Consumer durables (domestic and other)	1.2	1.1	1.2	1.4	0.3	1.9	1.9	2.0	6.5
Other enterprises (not elsewhere specified)	7.3	14.0	5.2	1.4	6.8	6.8	4.8	4.2	4.6
B. SOCIAL, COMMUNITY & PERSONAL SERVICES	**5.1**	**8.4**	**7.3**	**4.0**	**2.9**	**7.0**	**2.6**	**11.9**	**15.3**
C. OTHER ACTIVITIES (not elsewhere specified)	**6.0**	**16.7**	**8.4**	**7.5**	**18.2**	**9.9**	**12.3**	**18.3**	**5.8**
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Other recent publications in the AERC Research Papers Series:

Poverty, Inequality and Welfare Effects of Trade Liberalization in Côte d'Ivoire: A Computable General Equilibrium Model Analysis, by Bédia F. Aka, Research Paper 160.

The Distribution of Expenditure Tax Burden before and after Tax Reform: The Case of Cameroon, by Tabi Atemnkeng Johennes, Atabongawung Joseph Nju and Afeani Azia Theresia, Research Paper 161.

Macroeconomic and Distributional Consequences of Energy Supply Shocks in Nigeria, by Adeola F. Adenikinju and Niyi Falobi, Research Paper 162.

Analysis of Factors Affecting the Technical Efficiency of Arabica Coffee Producers in Cameroon, by Amadou Nchare, Research Paper 163.

Fiscal Policy and Poverty Alleviation: Some Policy Options for Nigeria, by Benneth O. Obi, Research Paper 164.

FDI and Economic Growth: Evidence from Nigeria, by Adeolu B. Ayanwale, Research Paper 165.

An Econometric Analysis of Capital Flight from Nigeria: A Portfolio Approach, by Akanni Lawanson, Research Paper 166.

Extent and Determinnanttts of Child Labour in Uganda, by Tom Mwebaze, Research Paper 167.

Oil Wealth and Economic Growth in Oil Exporting African Countries, by Olomola Philip Akanni, Research Paper 168.

Implications of Rainfall Shocks for Household Income and Consumption in Uganda, by John Bosco Asiimwe, Research Paper 169.

Relative Price Variability and Inflation: Evidence from the Agricultural Sector in Nigeria, by Obasi O. Ukoha, Research Paper 170.

A Modelling of Ghana's Inflation: 1960–2003[1], by Mathew Kofi Ocran, Research Paper 171.

The Determinants of School and Attainment in Ghana: A Gender Perspective, by Harry A. Sackey, Research Paper 172.

Private Returns to Education in Ghana: Implications for Investments in Schooling and Migration, by Harry A. Sackey, Research Paper 173.

Oil Wealth and Economic Growth in Oil Exporting African Countries, by Olomola Philip Akanni, Research Paper 174.

Private Investment Behaviour and Trade Policy Practice in Nigeria, by Dipo T. Busari and Phillip C. Omoke, Research Paper 175.

Determinants of the Capital Structure of Ghanaian Firms, by Jochua Abor, Research Paper 176.

Privatization and Enterprise Performance in Nigeria: Case Study of some Privatized Enterprises, by Afeikhena Jerome, Research Paper 177.

Sources of Technical Efficiency among Smallholder Maize Farmers in Southern Malawi, by Ephraim W. Chirwa, Research Paper 178.

Technical Efficiency of Farmers Growing Rice in Northern Ghana, by Seidu Al-hassan, Research Paper 179.

Empirical Analysis of Tariff Line-Level Trade, Tariff Revenue and Welfare Effects of Reciprocity under an Economic Partnership Agreement with the EU: Evidence from Malawi and Tanzania, by Evious K. Zgovu and Josaphat P. Kweka, Research Paper 180.

Effect of Import Liberalization on Tariff Revenue in Ghana, by William Gabriel Brafu-Insaidoo and Camara Kwasi Obeng, Research Paper 181.

Distribution Impact of Public Spending in Cameroon: The Case of Health Care, by Bernadette Dia Kamgnia, Research Paper 182.

Social Welfare and Demand for Health Care in the Urban Areas of Côte d'Ivoire, by Arsène Kouadio, Vincent Monsan and Mamadou Gbongue, Research Paper 183.

Modelling the Inflation Process in Nigeria, by Olusanya E. Olubusoye and Rasheed Oyaromade, Research Paper 184.

Determinants of Expected Poverty Among Rural Households in Nigeria, by O.A. Oni and S.A. Yusuf, Research Paper 185.

Exchange Rate Volatility and Non-Traditional Exports Performance: Zambia, 1965–1999, by Anthony Musonda, Research Paper 186.

Macroeconomic Fluctuations in the West African Monetary Union: A Dynamic Structural Factor Model Approach, by Romain Houssa, Research Paper 187.

Price Reactions to Dividend Announcements on the Nigerian Stock Market, by Olatundun Janet Adelegan, Research Paper 188.

Does Corporate Leadership Matter? Evidence from Nigeria, by Olatundun Janet Adelegan, Research Paper 189.

Determinants of Child Labour and Schooling in the Native Cocoa Households of Côte d'Ivoire, by Guy Blaise Nkamleu, Research Paper 190.

Analysis of Health Care Utilization in Côte d'Ivoire, by Alimatou CISSE, Research Paper 191.

Poverty and the Anthropometric Status of Children: A Comparative Analysis of Rural and Urban Household in Togo, by Kodjo Abalo, Research Paper 192.

African Economic and Monetary Union (WAEMU)[1]*,* by Sandrine Kablan, Research Paper 193.

Economic Liberalization, Monetary and Money Demand in Rwanda: 1980–2005, by Musoni J. Rutayisire, Research Paper 194.

An Empirical Analysis of the Determinants of Food Imports in Congo, by Léonard Nkouka Safoulanitou and Mathias Marie Adrien Ndinga, Research Paper 195.

Determinants of a Firm's Level of Exports: Evidence from Manufacturing Firms in Uganda, by Aggrey Niringiye and Richard Tuyiragize, Research Paper 196.

Supply Response, Risk and Institutional Change in Nigerian Agriculture, by Joshua Olusegun Ajetomobi, Research Paper 197.

Multidimensional Spatial Poverty Comparisons in Cameroon, by Aloysius Mom Njong, Research Paper 198.

Earnings and Employment Sector Choice in Kenya, by Robert Kivuti Nyaga, Research Paper 199.

Covergence and Economic Integration in Africa: the Case of the Franc Zone Countries, by Latif A.G. Dramani, Research Paper 200.

Determinants of Employment in the Formal and Informal Sectors of the Urban Areas of Kenya, by Wambui R. Wamuthenya, Research Paper 201.

Financial Sector Liberalization and Productivity Change in Uganda's Commercial Banking Sector, by Kenneth Alpha Egesa, Research Paper 202.

Fiscal Reforms and Income Inequality in Senegal and Burkina Faso: A Comparative Study, by Mbaya Diene, Research Paper 203.

Factors Influencing Technical Efficiencies among Selected Wheat Farmers in Uasin Gishu District, Kenya, by James Njeru, Research Paper 204.

Exact Configuration of Poverty, Inequality and Polarization Trends in the Distribution of well-being in Cameroon, by Francis Menjo Baye, Research Paper 205.

Child Labour and Poverty Linkages: A Micro Analysis from Rural Malawian Data, by Leviston S. Chiwaula, Research Paper 206.

The Determinants of Private Investment in Benin: A Panel Data Analysis, by Sosthène Ulrich Gnansounou,Research Paper 207.

Contingent Valuation in Community-Based Project Planning: The Case of Lake Bamendjim Fishery Re-Stocking in Cameroon, by William M. Fonta, Hyacinth E. Ichoku and Emmanuel Nwosu, Research Paper 208.

Multidimensional Poverty in Cameroon: Determinants and Spatial Distribution, by Paul Ningaye, Laurent Ndjanyou and Guy Marcel Saakou, Research Paper 209.

What Drives Private Saving in Nigeria, by Tochukwu E. Nwachukwu and Peter Odigie, Research Paper 210.

Board Independence and Firm Financial Performance: Evidence from Nigeria, by Ahmadu U. Sanda, Tukur Garba and Aminu S. Mikailu, Research Paper 211.

Quality and Demand for Health Care in Rural Uganda: Evidence from 2002/03 Household Survey, by Darlison Kaija and Paul Okiira Okwi, Research Paper 212.

Capital Flight and its Determinants in the Franc Zone, by Ameth Saloum Ndiaya, Research Paper 213.

The Efficacy of Foreign Exchange Market Intervention in Malawi, by Kisukyabo Simwaka and Leslie Mkandawire, Research Paper 214.

The Determinants of Child Schooling in Nigeria, by Olanrewaju Olaniyan, Research Paper 215.

Influence of the Fiscal System on Income Distribution in Regions and Small Areas: Microsimulated CGE Model for Côte d'Ivoire, by Bédia F. Aka and Souleymane S. Diallo, Research Paper 216.

An Econometric Analysis of the Monetary Policy Reaction Function in Nigeria, by Chukwuma Agu, Research Paper 217.

*Analysis of Technical Efficiency Differentials among Maize Farmers in Nigeri*a, by Luke Oyesola Olarinde, Research Paper 218.

Import Demand in Ghana: Structure, Behaviour and Stability, by Simon Lwadzpgah Harvey and Kordzo Sedegah, Research Paper 219.

Monetary Policy Rules: Lessons Learned from ECOWAS Countries, by Alain Siri, Research Paper 220.

Volatility of resources inflows and Domestic Investment in Cameroon by Sunday A. Khan, Research Paper 221.

Efficiency Wage, Rent-Sharing Theories and Wage Determination in Manufacturing Sector in Nigeria by Ben E. Aigbokhan, Research Paper 222.

Government Wage Review Policy and Public-Private Sector Wage Differential in Nigeria by Alarudeen Aminu, Research Paper 223.

Rural Non-Farm Incomes and Poverty Reduction In Nigeria by Awoyemi Taiwo Timothy, Research Paper 224.

After Fifteen Year Use of the Human Development Index (HDI) of the United Nations Development Program (UNDP): What Shall We Know? by Jean Claude Saha, Research Paper 225.

Uncertainty and Investment Behavior in the Democratic Republic of Congo by Xavier Bitemo Ndiwulu and Jean-Papy Manika Manzongani, Research Paper 226.

An Analysis of Stock Market Anomalies and Momentum Strategies on the Stock Exchange of Mauritius by Sunil K. Bundoo, Research Paper 227.

The Effect of Price Stability On Real Sector Performance in Ghana by Peter Quartey, Research Paper 228.

The Impact of Property Land Rights on the Production of Paddy Rice in the Tillabéry, Niamey and Dosso Regions in Niger by Maman Nafiou Malam Maman and Boubacar Soumana, Research Paper 229.

An Econometric Analysis of the Monetary Policy Reaction Function in Nigeria by Chukwuma Agu, Research Paper 230.

Investment in Technology and Export Potential of Firms in Southwest Nigeria by John Olatunji Adeoti, Research Paper 231.

Analysis of Technical Efficiency Differentials among Maize Farmers in Nigeria by Luke Oyesola Olarinde, Research Paper 232.

Import Demand in Ghana: Structure, Behaviour and Stability by Simon Kwadzogah Harvey and Kordzo Sedegah, Research Paper 233.

Trade Liberalization Financing and Its Impact on Poverty and Income Distribution in Ghana by Vijay K. Bhasin, Research Paper 234.

An Empirical Evaluation of Trade Potential in Southern African Development Community by Kisukyabo Simwaka, Research Paper 235.

Government Capital Spending and Financing and Its Impact on Private Investment in Kenya: 1964-2006 by Samuel O. Oyieke, Research Paper 236.

Determinants of Venture Capital in Africa: Cross Section Evidence by Jonathan Adongo, Research Paper 237.

Social Capital and Household Welfare in Cameroon: A Multidimensional Analysis by Tabi Atemnkeng Johannes, Research Paper 238.

Analysis of the determinants of foreign direct investment flows to the West African and Economic Union countries by Yélé Maweki Batana, Research Paper 239.

Urban Youth Labour Supply and the Employment Policy in Côte d'Ivoire by Clément Kouadio Kouakou, Research Paper 240.

Managerial Characteristics, Corporate Governance and Corporate Performance: The Case of Nigerian Quoted Companies by Adenikinju Olayinka, Research Paper 241.

Effects of Deforestation on Household Time Allocation among Rural Agricultural Activities: Evidence from Western Uganda by Paul Okiira Okwi and Tony Muhumuza, Research Paper 242.

The Determinants of Inflation in Sudan by Kabbashi M. Suliman, Research Paper 243.

Monetary Policy Rules: Lessons Learned From ECOWAS Countries by Alain Siri, Research Paper 244.

Zimbabwe's Experience with Trade Liberalization by Makochekanwa Albert, Hurungo T. James and Kambarami Prosper, Research Paper 245.

Determinants in the Composition of Investment in Equipment and Structures in Uganda by Charles Augustine Abuka, Research Paper 246.

Corruption at Household Level in Cameroon: Assessing Major Determinants by Joseph-Pierre Timnou and Dorine K. Feunou, Research Paper 247.

Growth, Income Distribution and Poverty: The Experience Of Côte d'Ivoire From 1985 To 2002 by Kouadio Koffi Eric, Mamadou Gbongue and Ouattara Yaya, Research Paper 248.