The Role of Credit, Money, and Exchange Rate Channels on Monetary Transmission Mechanism in Five East Africa Community (EAC) Countries

[1*]Cuthberth Mlosa, [2]Lukman Hakim, [3]Siti Aisyah Tri Rahayu

[1,2,3]Department of Economic and Development Studies, Faculty of Economic and Business,
University of Sebelas Maret, Surakarta, Indonesia
[1]Department of Banking and Finance, Institute of Finance Management, Tanzania
[*]Corresponding author: mlosa1990@gmail.com

Abstract—**In order to conduct successful monetary policy under monetary union it is important to understand the role of transmission channels in the monetary transmission mechanism. The performance of these channels is influenced by the economic structure prevailing in specific country; therefore differences in transmission mechanisms can generate different behavior in output to the real economy. This paper aim to examine the role of three transmission channels (credit, money supply and exchange rate) on monetary transmission mechanism in EAC countries, this is relevant to the region as these countries signed the protocol to form monetary union. The paper employ panel data approach with the cross section and time series data of five countries and twenty two year's respectively. The findings reveal that money supply channel has positive and significant effect to the real economy hence it play important role in transmission of monetary policy in EAC countries. Remain channels (credit and exchange rate are not significant in transmission mechanism thus may not be important in transmission monetary policy to EAC countries.**

Key words— Monetary Transmission Mechanism; Credit channel; Money supply channel; Exchange rate channel; East Africa Community (EAC).

I. INTRODUCTION

Monetary policy plays an important role toward achieving the ultimate economic objective of sustainable growth full employment and rice stability (Hossain Akhand A., 2009). Monetary policy operate through monetary tools like money supply, credit, interest rate and exchange rate, these tools are also called monetary transmission channels which used to transmits monetary policy to the real economy like gross domestic product with the aim of achieving single or multiple objective like tacking employment, price stability and economic growth (Mishkin, 2004). A pre-request of having successful monetary policy strategy is the monetary authorities must have an accurate knowledge on the assessment of timing and effect of their policy on the economy in other word understand the relationship between operating targets and ultimate targets variables. That's means in order to conduct successful monetary policy it require an understanding of the mechanism of transmitting monetary policy through which channel monetary policy affect economy on the specific area (Mishkin 1995, Ramlogan 2006).

The East Africa Community (EAC) has been revived and one of the objectives is to establish monetary union and introduce common currency. Heads of the five member states of EAC signed the agreement of establishing monetary union 2013, the agreement to be implemented next 10 years. On that agreement EAC member states are expected to corporate in monetary and financial sectors and establish one central bank that's means EAC member states will sacrifice their monetary and exchange policies to the one authority (Muthui, Makambi, & Musyoka, 2016). The important concern in formation of monetary union is that the transmission mechanism across the member of the union must be similar. Although monetary policy operates through the monetary transmission channels to transfer monetary policy to the real economy but the performance of each channel it depend on economic and financial structure of predominating country. In that instance, if EAC countries has different monetary channel in transmission of monetary policy, single monetary policy will lead different result to the real economy among the members state. Then similarities on the monetary transmission channels will leads countries to experience similar external shock which will increase the viability EAC member state to establish monetary union and to have win-win monetary policy. To have effective monetary policy is crucial for EAC member state to insuring that countries attain homogeneity before and after the monetary union (Muwanga, 2016). The basic lesson from Europeans Monetary Union (EMU) crisis is that serious disequilibrium result from regional arrangements was not designed to be robust to a variety of shocks. This is the strong signal that EMU sent to other common currency regional on the goal of real and monetary policy convergence(Asongu, 2014). The different in the structure of economies in euro area gives the rise of asymmetries in the transmission of common monetary policy, which means the important concern for EAC countries in establishing monetary union is similarity on transmission on monetary policy among member state in order to insure all countries are benefit from monetary union.

Therefore, the main purpose of this study is to access the role credit, money supply and exchange rate on monetary transmission mechanism in five EAC countries. From this study there are two objectives first, to access the role of each mention channel on transmission monetary policy through which channel monetary policies are transmitted to bring result to the real economy in each member state. Second, to compare the monetary transmission mechanism channels among five EAC countries. The empirical results of this study are derived from panel data approach; the approach will access the strength of each channel to each EAC country in transmission of monetary policy.

II. LITERATURE REVIEW

In this section we review related literature on the concept of monetary transmission mechanism and its channels of transmission. According to (Mishkin Frederic S., Metthews Kent 2013) to understand the mechanism through which monetary policy affects the economy is important for monetary policymakers to have the knowledge in assessment of time and effect of their policies on the economy. This drive concentration and discussion on monetary transmission mechanism and analysis on how monetary policies are transmitted to the real economy.

Ramlogan 2006 does empirical analysis on monetary transmission mechanism in four Caribbean countries: Jamaica, Trinidad and Tobago, Barbados and Guyana, with the aim of identifying to importance of monetary channels on monetary transmission mechanism by using VAR model. The result shows that in four countries credit and exchange rate are more important than money channel in transmitting of monetary impulse from financial sector to real sector. Fan 2011 examine the monetary transmission mechanism China, by using four channels of monetary policy transmission the study focus on findings the comparison of behaviours, different roles and impact of each transmission channels in monetary policy transmission to the economy. The study use VAR model and the results shows bank landing channel is dominant channel for transmission of monetary policy and influence the economic performance while other channels like exchange rate and interest rate are still improved. (Afrin, 2017) explore the monetary transmission mechanism in Bangladesh, the stud focus on explore the role of two channels which are lending and exchange rate. By using SVAR model the result shows that banking landing playing a non-trivial role in influencing output and inflation however the responses are short-lived compared to the monetary policy shock while exchange rate is still less effective in transmission of monetary policies.

The previous study of (Wulandari, 2012) in Indonesia by using Structural Vector Auto-regression (SVAR) finds that credit channel and interest channel both play important role in transmission of monetary policies to the real economy. The finds show that credit channel is a dominate channel on impacting monetary policy to the economic growth and interest rate is dominate role for the managing inflation.

There is also considerable empirical work regarding to the role of credit to the real economy (Montes & Machado, 2013) by using theoretical model of Bernanke and Blinder and Ferreira verifies the transmission of monetary policy through credit channel. The finds show that supply of credit plays important role to the economy by exerts both employment and output gap.

Monetary policy is a powerful tool in control economy and to stabilize inflation. Since 1970's there increase discussion on understand the ways in which monetary policy affect the economy. (Mishkin, 1995) gives clarification on how to conduct successful monetary policy, that sometimes monetary policy can proved unexpected result. In order to have successful monetary policy, monetary authority must have accurate assessment of timing and effects of their policies in the economy and this need clear understanding of monetary policy transmission mechanism through which monetary channel, monetary policy are transmitted to the economy.

There is a main key difference between this study and other previous studies contacted on the role on monetary transmission mechanism. The first difference related to econometrical model employed in analysis monetary transmission, most of literature conducted on monetary transmission mechanism use VAR or SVAR econometric model in the analysis monetary transmission none of this study reviewed by panel data model. This study employ panel data model. Second the study review three transmission mechanism channel in five EAC countries that make to be the first study to be conducted which is also relevant reference to the current process of monetary union in EAC member states.

III. DATA AND METHODOLOGY

A. Theory

The important of understanding the role of monetary channels on transmission of monetary policy to the real economy supported by theory developed by Keynesian which discussed by (Mishkin Frederic S., Metthews Kent 2013, p.525). Structural model specific analyze about the channels through which the money supply affect economic activity (transmission mechanism of monetary policy) the approach examine the effect of change of money supply on economic activity.

$$M \Rightarrow i \Rightarrow I \Rightarrow Y$$

The model described the transmission of monetary policy as follow; the change in money supply M affects interest rates i which turn to affect investment I and aggregate output or aggregate spending Y. Exchange rate channel another attentions has been paid on transmission on monetary policy through exchange rate which affects net export.(Mishkin, 1995) emphasis the important of exchange rate channel of monetary transmission and elaborate the mode of transmission of monetary policy to the real output.

$$M \Rightarrow i \Rightarrow E \Rightarrow NX \Rightarrow Y$$

Whereby change in money supply M affect interest rates i the effect turn to affect the value of the currency E which affect the net export NX which turn to affect aggregate output Y. The model also involves interest effect because when domestic interest rate change led the value domestic currency to change against other currencies which turn to affect the export and import of goods and services.

Credit channel the important of recognizing credit channel on transmission of monetary policy has been supported by (Bernanke & Blinder, 1988) and (Mishkin, 1995). The credit channel or lending channel based on the view that banks plays special role in financial system by affecting borrowers and small business firms where the problem of asymmetric information can be pronounced. Monetary policy through credit channel has its impact through borrowers.

$$M \Rightarrow bank\ deposits \Rightarrow bank\ loan \Rightarrow I \Rightarrow Y$$

Whereby the monetary policy; money supply M affects bank on deposits side the effect turn to affect bank loan capacity this affect investment I the effect tend to affect aggregate output Y.

B.   Data

We examine the role of three monetary channels in transmission of monetary policy, through which monetary shocks are transmitted to the real economy in the EAC countries. The data obtained from World Bank data base with the period of 1995-2016. The main variables on this study are money supply, credit and exchange rate which are independent variables and Gross Domestic Credit (GDP) which is dependent variable. Money supply represented by annual broad money supply measured in Local Currency Unity (LCU). Annual total domestic credit (LCU) used as anxious measure of credit which also used to measure the ability of banks to grant credit to economic operators and official exchange rate is anxious measure of exchange rate. Three monetary channels (money supply, credit and exchange rate) will be test to see its impacts to the aggregate output or real economic which is measured by GDP. GDP is one of primary indicator that used to gauge the health of country's economic as it supported by (Asongu, 2014). Annual total GDP (constant LCU) used as anxious measure of GDP.

C.   Methodology

Panel data approach employed for analysis of data. Panel data refers to pool observation of time series and cross-sectional data of the same unit's link people, firms, cities countries etc., in several different times of periods. The main advantage of panel data is controlling for individual heterogeneity this has supported by Greene(2008:334) and Baltagi(2005:4) cited in (Shen & Holmes, 2014).

The regression model of panel data

$$log\ GDP_{it} = B_0 + \beta_1\ log\ MONEY_{it} + \beta_2\ log\ CREDIT_{it} + \beta_3 log\ EXCHANGE_{it} + \varepsilon_{it}$$

where GDP = growth domestic product; MONEY = money transmission channel; CREDIT = credit transmission channel; and EXHANGE = exchange rate transmission channel

IV.   FINDING AND DISCUSSION

To analyze data by using panel we first compare the result of fixed effect model and common effect model by using Chow test. This will help to find the difference between two models which are fixed effect model and common effect model; second the result of Chow test helps in selection of which model is advisable to choose for the result analysis. If the result of Chow test is significantly and the probability is below 0.05 the model used is fixed effect and vice versa is true. Based on the result of Chow test fixed effect model was selected to analyze the results.

A.   Chow Test

Table I shows the summary result of chow test, which is significantly at 0.05 probabilities level. This implies fixed effect model is more relevant to interpret our result than common effect model.

After the result of Chow test another test is to identify the difference between fixed effect model and random effect model by using Hausman test. This helps to find the difference between two models (fixed and random effect model) and also the result of Hausman test will help to know model we have to choose to estimate the result of analysis. If the result of Hausman test is

significantly and the probability is below 0.05 the model used is fixed effect and vice versa is true. Based on the result of Hausman test fixed effect model was selected for the analysis of results.

TABLE I.   CHOW TEST PANEL DATA EAC COUNTRIES

Redundant Fixed Effects Tests Pool: FIXED Test cross-section fixed effects			
Effects Test	*Statistic*	*d.f.*	*Prob.*
Cross-section F	685.260207	(4,96)	0.0000
Cross-section Chi-square	352.161597	4	0.0000

B. Hausman Test

TABLE II.   HAUSMAN TEST PANEL DATA EAC COUNTRIES

Correlated Random Effects - Hausman Test Pool: FIXED Test cross-section random effects			
Test Summary	*Chi-Sq. Statistic*	*Chi-Sq. d.f.*	*Prob.*
Cross-section random	244.427158	3	0.0000

The result of hausman test show that fixed effect more is more relevant to interpret the result than random effect with the probability of 0.000 which is below 5%.

From the result of fixed effect model shows that independent variable money supply is significant at 0.0000 probability level, also has positive coefficient value of 0.34873. That means the relation of money supply and GDP is positive and significant hence transmission of monetary policy through money supply is feasible option for EAC countries as it will bring positive effect to the economy. The finding explores that credit channel and exchange rate channel are not significance and that may not be important in transmission of monetary policy in EAC countries. The effects of monetary policy shocks could be similar and significantly positive to the real economy for EAC countries as the transmission of the monetary policy could be through money supply channel. The result of fixed effect model common effect and random effect models shows on the tables below.

C. Fixed Effect Model

TABLE III.   FIXED EFFECT MODEL PANEL DATA EAC COUNTRIES

Dependent Variable: LOG(GDP?); Method: Pooled Least Squares Sample: 1995 2016; Included observations: 22; Cross-sections included: 5 Total pool (unbalanced) observations: 104				
Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	19.25109	0.268451	71.71163	0.0000
LOG(MONEY?)	0.348783	0.044067	7.914808	0.0000
LOG(CREDIT?)	-0.011454	0.036257	-0.315905	0.7528
LOG(EXCHANGE?)	0.138192	0.075454	1.831462	0.0701
Fixed Effects (Cross)				
KEN--C	-0.461041			
_TZA--C	0.775184			
UGA--C	0.958013			
RWA--C	-0.310850			
BDI--C	-1.321794			
R-squared	0.996023	Mean dependent var		29.50162
Adjusted R-squared	0.995733	S.D. dependent var		1.296480
Sum squared resid	0.688470	Akaike info criterion		-2.025951
F-statistic	3435.000	Schwarz criterion		-1.822536
Prob(F-statistic)	0.000000	Durbin-Watson stat		0.156202
Hannan-Quinn criter.	-1.943542			

The result shows only one variable (money) is significant at 5% probability. The probability value of credit and exchange is above 0.05 means that none of these variables are significant and the relationship with depend variable (GDP) will not be viable. However the coefficient value of money is 0.348783. That means money supply has positive and significant relationship with real economy (GDP).

The result of credit and exchange rate channel cast some doubt on the meaningfulness of co-integrating relationship between the transmission mechanisms of monetary policy its impact to the real economy. This is interesting to investigate the issue further as it is against the model. Credit views as financial accelerator thus it stimulates investments and increase aggregate output, the

model developed by Bernanke et el (1996); cited in(Taylor, 2000) gives the key assumption that views credit as a financial accelerator is "internal borrowing is cheaper than external borrowing. Hence an increase in net worth which would accompany a reduction of interest rate increase firms ability to finance investment internally". (Mishkin, 1995) argue that the performance bank landing channel based on the views of the special role played by banks in the financial system. If that the case the negatively significant of credit channel in EAC countries coursed by under-developed financial systems and small bank system. This resulted to tightening of credit, lending and very low interest rate. This leads to small lending capacity of banks and financial institutions and reduce credit supply. In other word we can say EAC countries are experiencing credit crunch where by investment capital become hard to obtain. Also it is worth to investigate the exchange rate behaviors of EAC countries. The research conducted by (Muwanga, 2016) on exchange rate convergence in EAC countries shows divergence and unstable exchange rate for EAC member state. Kenya, Rwanda and Burundi show lacking of convergence with Uganda and Tanzania that's means there is lacking of complete convergence of the exchange rate for the all pairs of EAC countries. In order to have successful transmission of monetary policy shock to the economy through exchange rate channel, timing and the magnitude of the effect of the change of in exchange rate on output must be the same to member state(Smets & Wouters, 1999).

D. Common Effect Model

TABLE IV.   COMMON EFFECT MODEL PANEL DATA EAC COUNTRIES

Dependent Variable: LOG(GDP?); Method: Pooled Least Squares Sample: 1995 2016; Included observations: 22; Cross-sections included: 5 Total pool (unbalanced) observations: 104				
Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
LOG(MONEY?)	2.136387	0.215962	9.892415	0.0000
LOG(CREDIT?)	-1.080119	0.211951	-5.096080	0.0000
LOG(EXCHANGE?)	-0.029443	0.071428	-0.412210	0.6811
R-squared	0.692884	Mean dependent var		29.50162
Adjusted R-squared	0.686803	S.D. dependent var		1.296480
S.E. of regression	0.725563	Schwarz criterion		2.300964
Sum squared resid	53.17059			
Hannan-Quinn criter	2.255587			
Durbin-Watson stat	0.076090			

The table summarize the result on common effect model shows that money supply significantly and positively affect the dependent variables GDP. While credit and exchange rate has negative effect to the GDP. According to the result of chow test fixed effect has chose against the model (common effect model) to interpret the findings.

E. Random Effect Model

TABLE V.   RANDOM EFFECT MODEL PANEL DATA EAC COUNTRIES

Dependent Variable: LOG(GDP?); Method: Pooled EGLS (Cross-section random effects) Sample: 1995 2016; Included observations: 22; Cross-sections included: 5 Total pool (unbalanced) observations: 104				
Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	18.49103	0.254920	72.53670	0.0000
LOG(MONEY?)	0.475498	0.040444	11.75700	0.0000
LOG(CREDIT?)	-0.128434	0.035387	-3.629443	0.0004
LOG(EXCHANGE?)	0.198246	0.041574	4.768547	0.0000
Random Effects (Cross)				
_KEN--C	-0.220222			
_TZA--C	0.751087			
_UGA--C	0.890927			
_RWA--C	-0.223605			
_BDI--C	-1.198187			
Weighted Statistics				
R-squared	0.868827	Mean dependent var		4.726753
Adjusted R-squared	0.864892	S.D. dependent var		0.440864
S.E. of regression	0.156479	Sum squared resid		2.448566
F-statistic	220.7834	Durbin-Watson stat		0.065040
Prob(F-statistic)	0.000000			
Unweighted Statistics				
R-squared	0.658897	Mean dependent var		29.50162
Sum squared resid	59.05477	Durbin-Watson stat		0.002697

The result shows all independent variable are significant at 5% probability. That means in one way or another independent arable affect the dependent variable GDP. The coefficient values show positive relationship of money and exchange with GDP and negative relationship between credit and GDP. This means that money supply and exchange rate has positive impact to the economy (GDP). However the fixed effect model has chosen to interpret findings against random effect model. Refer to table 2. Result of hausman test.

V.   CONCLUSION

The objective of this research is to explore the role of monetary transmission channels (credit, money and exchange rate) in five EAC countries to see which channel is stronger on transmitting monetary policy shock to the real economy. In order to meet this objective the study employs panel data analysis technique. The method allows identification of the strengths of the channel from the impulse response function also cross country analysis allows an assessment of the similarity of these transmission mechanisms across the EAC countries. The analysis suggest that among three channels (money, credit and exchange rate) money supply channel is feasible option for transmission on monetary policy in EAC counties since it brings positive significant effect to the real output. The finds discover that credit channel neither significant nor positive affecting the economy while exchange rate channel brings positive impact to the economy but is not significant in transmission of monetary policy in EAC countries. Therefore this is advised for further research to explore factors that influence credit and exchange rate in the member countries. Also more research on other monetary channels should be considered before reach definitive conclusion.

The implication of the findings is clear. In recent time the Heads of EAC member states signed the protocol of establishing East African Monetary Union to be implemented in 2023. The protocol will led to the creation of single regional central bank. The important concerning in formation of monetary union is that the transmission mechanism across the member states be similar. This will led the transmission of monetary policy from central bank to bring similar impact to the real economy and member states will experience similar behaviour of price and real output. The findings show that money supply channel is more effective in EAC countries and is more advisable to be used to EAC member states in transmission of monetary policy mechanism that will bring positive effect to the economy to all member states.

REFERENCES

Afrin, S. (2017). Journal of Asian Economics Monetary policy Transmission in Bangladesh : Exploring the lending channel. *Journal of Asian Economics*, *49*, 60–80. https://doi.org/10.1016/j.asieco.2016.10.003

Asongu, S. (2014). Policy   Convergence Analysis Are proposed African Monetary Unions Optimal Currency Areas ? Real , monetary and fiscal policy convergence analysis. *African Journal of Economic and Management Studies*, *5*(1), 9–29. https://doi.org/10.1108/AJEMS-02-2012-0010

Bernanke, B. S., & Blinder, A. S. (1988). Credit , Money and Aggregate Demand. *National Bureau of Economic Research*, (2534).

Fan, Y. (2011). Studying on the Monetary Transmission Mechanism in China in the Presence of Structural Changes. *China Finance Review International*, *1*(4), 334–357. https://doi.org/10.1108/20441391111167478

Hossain Akhand A. (2009). *Central Banking and monetary Policy in the Asia-Pacific*. Edward Elgar Publishing Limited.

Mishkin, F. S. (1995). Symposium on the Monetary Transmission Mechanism. *Journal of Economic Perspectives*, *9*(4), 3–10.

Mishkin, F. S. (2004). *The Economics of Money, Banking and Financial Markets* (Seventh Ed).

Mishkin Frederic S., Metthews Kent, G. M. (2013). *The Economics of Money, Banking & Financial Markets* (EUROPEAN E).

Montes, G. C., & Machado, C. C. (2013). Credibility and the Credit Channel Transmission of Monetary Policy Theoretical Model and Econometric Analysis for Brazil. *Journal of Economic Studies*, *40*(4), 469–492. https://doi.org/10.1108/JES-07-2011-0086

Muthui, J. N., Makambi, S. A., & Musyoka, P. K. (2016). A G-Ppp Analysis to the Eac Monetary Integration Process. *International Journal of Business and Social Science*, *7*(1), 86–98. Retrieved from www.ijbssnet.com

Muwanga, G. S. (2016). Exchange Rate Convergence in the East African Monetary Union : An Econometric Investigation. *International Journal of African and Asian Studies*, *20*, 71–88.

Ramlogan, C. (2006). The Transmission Mechanism of Monetary policy Evidence from the Caribbean. *Journal of Economic Studies*, *31*(5), 435–447. https://doi.org/10.1108/01443580410555537

Shen, X., & Holmes, M. J. (2014). Are Stock Prices Stationary? Some new evidence from a panel data approach. *Studies in Economics and Finance*, *31*(4). Retrieved from http://dx.doi.org/10.1108/SEF-09-2012-0106

Smets, F., & Wouters, R. A. F. (1999). The Exchange Rate and the Monetary Transmission Mechanism in Germany*. *De Economist*, *147*(4), 489–521.

Taylor, J. B. (2000). Alternative Views of the Monetary Transmission Mechanism : What difference do they make for monetary policy ? *Oxford Review of Economic Policy*, *16*(4), 20–21.

Wulandari, R. (2012). Do Credit Channel and Interest Rate Channel Play Important Role in Monetary Transmission Mechanism in Indonesia ? : A Structural Vector Autoregression Model. *International Congress on Interdisciplinary Business and Social Science*, *65*(ICIBSoS), 557–563. https://doi.org/10.1016/j.sbspro.2012.11.165