ISSN 2090-3359 (Print)
ISSN 2090-3367 (Online)

Advances in Decision Sciences

Volume 25
Issue 2
June 2021

Michael McAleer

Editor-in-Chief
University Chair Professor
Asia University, Taiwan

Published by Asia University, Taiwan

ADS@ASIAUNIVERSITY

Threshold Effect of Inflation on Agricultural Growth: Evidence from Developing Countries

Goodness C. Aye[**]

Department of Economics
University of South Africa
Pretoria, South Africa

Nicholas M. Odhiambo

Department of Economics
University of South Africa
Pretoria, South Africa

Revised: May 2021

* The authors are grateful to a reviewer for helpful comments and suggestions
* * Correspondence: goodness.aye@gmail.com

Abstract

The paper examined the inflation-agricultural growth nexus in developing countries with the aim of identifying the inflation threshold that could benefit or harm the sector. We used panel data from 1970 to 2019 and the dynamic panel threshold model which accounts for endogeneity. Aside from inflation and agriculture GDP growth, we included the foreign direct investment (FDI), domestic credit to the private sector, and urbanization as control variables. The results show that credit has an enhancing effect on agriculture while urbanization has a diminishing effect. More importantly, we established that the inflation threshold is 5.997 %. Below this threshold, the effect of inflation on agricultural growth is positive, while the effect above the threshold is negative and stronger.

Keywords: Agriculture, Dynamic panel, Growth, Inflation, Threshold.
JEL: C23, E31, E52, O47, Q10.

1. Introduction

Agriculture is one of the key sectors in the economy of developing countries. In the manufacturing sector, agriculture plays the biggest role by supplying raw materials such as cassava, fish, sugarcane, cotton lint and citrus for further processing. Agriculture represents a dynamic way out of poverty. With several fast-growing subsectors including coffee, livestock, poultry, and aquaculture, strong engagement with exports, and relatively high fertiliser and insecticide use, agriculture is found to be twice as important for exiting poverty as non-farm occupations (Thang et al., 2006).

Agriculture growth has been identified as a necessary tool for alleviation and eradication of rural poverty and hunger (Kakwani, 1993; Ravallion and Datt, 1996; Thorbecke and Jung, 1996; Soloaga, 2006). Broad-based economic growth and development have also been identified to be the off-shoot of agricultural growth throughout global history with linkages between farm and non-farm economies generating widely based employment, income and growth.

Developing countries are seeking for ways to improve the lots of their economy through an improved agricultural sector. Production cost has been identified as a major factor affecting agricultural production vis-a-viz agricultural growth. The impact of growth on income poverty is principally transmitted via prices (higher producer prices, lower food prices, higher wages), and varies from one place and period to another depending on wider factors. Inflation is the fulcrum that drives prices of agricultural output, agricultural input and determines which side the pendulum swings on the agricultural growth and non-agricultural growth.

The relationship between inflation and economic growth has been the subject of considerable theoretical and empirical research since understanding the inflation-growth nexus is very important for monetary policy (Seleteng et al., 2013). Inflation is the constant rise in the general level of prices where a unit of currency buys less than it did in prior periods.

Traditionally, the relationship between inflation and economic growth is linear; the impact of inflation can be neutral, positive or negative depending on whether money is super-neutral (Sidrauski, 1967), substitute for capital (Mundell, 1965; Tobin, 1965) or complementary to capital (Stockman, 1981; Fischer, 1983).

The combination of high economic growth with low and stable inflation is the primary objective of macroeconomic policies (Seleteng et al., 2013; Vinayagathasan, 2013). Inflation that is too high harms the economy owing to its undesirable re-distributional and welfare effects (Eggoh and Muhammad, 2014), although, as proposed by Friedman (1969), negative inflation is never a policy agenda simply because a certain magnitude of inflation is necessary to 'grease the wheels' of the economy (Seleteng et al., 2013).

By fostering investment and promoting the efficient use of productive resources, low inflation promotes economic growth (Ahortor et al., 2011). This leaves one question: at which level does inflation turn from good to bad? In other words, what is the level at which monetary authorities should set inflation to avoid its adverse effects on growth – in this case agricultural growth? The answer to this question is the objective of this research. The fact that agricultural growth is necessary for economic growth and sustained development, coupled with the vagaries of inflation, informs our focus on investigating the threshold effect of inflation on agricultural growth.

In particular, inflation threshold is useful to policy makers in formulating policies that will keep the inflation rate below the threshold, thus evading the negative effects. Furthermore, while there are several studies on the threshold effect of inflation on economic growth, as shown in the literature review section, there is a dearth of sectoral analysis of this. Specifically, the threshold effect of inflation on agricultural growth has not received adequate attention.

The rest of the paper is organized as follows: Literature review is presented in section 2. Data are presented in section 3 while section 4 discusses the empirical model. Results are presented in section 5 while section 6 concludes.

2. Literature Review

This section examines past and related research studies on the relationship between inflation and economic growth on economies of the world with particular interest on data used, the methodology adopted, nature of the relationship and the estimated inflation thresholds. Most studies on the threshold effect of inflation on economic growth are dominated by cross-country panel studies (Sarel, 1996; Khan and Senhadji, 2001; Mallik and Chowdhury, 2001; Bawa and

Abdullahi, 2014; Drukker et al., 2005, Bick, 2005; Espinoza et al., 2010 and Kremer et al., 2009). The summary of the review is presented in Table 1.

Sarel (1996), in examining the non-linear effects of inflation on economic growth used annual panel data on GDP, CPI, population, terms of trade, real exchange rate, investment rates and government expenditures of 87 countries from 1970-1990 found a significant structural break (inflation threshold) in the function that relates economic growth to inflation. The threshold was estimated at 8 per cent, below which inflation did not have any effect on economic growth or it may have a slight positive effect. When it rose above the 8 per cent threshold, however, the estimated effect of inflation was significant, robust and extremely powerful. They noted that when the existence of the structural break is ignored, the estimated effect of inflation on economic growth for higher inflation rates decreased by a factor of three.

Khan and Senhadji (2001) utilized an unbalanced panel dataset covering the period 1960-1998 from 140 countries, comprising industrialized and developing countries in re-examining the issue of the existence of threshold effects on the relationship between inflation and economic growth. They found that beyond threshold levels of 3 and 12 per cent for industrialized and developing countries, respectively, the relationship between inflation and economic growth became negative. The authors noted that the peculiarities of industrialized economies remained different from those of the developing economies. However, they did not acknowledge the peculiarities existing among developing countries in terms of resources base, population size, level of corruption, poverty level, etc.

Akgül and Özdemir (2012) carried out an examination on Turkey for the period between 2003:01 and 2009:12 and investigated the nonlinear relationship between inflation rate and economic growth via two-regime TAR model. They found inflation threshold to be 1.26 per cent for the entire analysis period. It was seen that while an inflation rate over the threshold had a negative influence on economic growth, an inflation rate below the threshold had a positive influence.

Kremer et al. (2013) investigated the influence of inflation threshold on long-term economic growth based on the data from the period between 1950 and 2004 for 124 industrialized and non-industrialized countries. They predicted the inflation threshold to be 2 per cent for industrialized countries and 17 per cent for non-industrialized countries. They concluded that while an inflation rate over the threshold had a negative influence on economic growth, an inflation rate

below the threshold had an insignificant influence on it. These results support the view that inflation deters growth in developing countries.

Vinayagathasan (2013) investigated the relationship between inflation and economic growth for 32 Asian countries for the period between 1980 and 2009 via a dynamic panel threshold model. The threshold value for the influence of inflation on economic growth was indicated to be 5.43 per cent. It was determined that while an inflation rate over this threshold had a negative influence on economic growth, an inflation rate below this threshold did not have any influence whatsoever.

Aydın et al. (2016) investigated the influence of inflation on economic growth for five Turkish Republics (Azerbaijan, Kazakhstan, Kyrgyzstan, Uzbekistan, and Turkmenistan) that are in the transition period through dynamic panel data analysis based on a threshold model. The paper indicated that there is a nonlinear relationship between inflation and growth rate; the threshold for the influence of inflation on economic growth is 7.97 per cent, and an inflation rate above this threshold has a negative influence on economic growth while an inflation rate below this threshold has a positive influence on economic growth. These results show that a high inflation rate will have a considerable influence on economic growth.

Gillman et al. (2002), based on a panel data of Organization for Economic Cooperation and Development (OECD) and Asia-Pacific Economic Cooperation (APEC) countries, indicate that the reduction of high and medium inflation (double digits) to single-digit figures has a significant positive effect on growth for the OECD countries, and to a lesser extent for the APEC countries. They further add that the effect of an expected deceleration of inflation might only be observed when the world economy is not facing a sudden growth rate deceleration due to shocks. a reduction in the inflation rate can produce a considerably higher growth rate. Similarly, Alexander (1997) found a strong negative influence of inflation on the growth rate of per capita GDP using a panel of OECD countries.

Bawa and Abdullahi (2014) employed the threshold regression model developed by Khan and Senhadji (2001) for the analysis of threshold level of inflation for both industrial and developing countries using quarterly time series data for the period 1981 to 2009. They found a threshold inflation level of 13 per cent for Nigeria. They found that below the threshold level, inflation has a mild effect on economic activities, while above it, the magnitude of the negative effect of inflation on growth was high. The negative and significant relationship between inflation

and economic growth for inflation rates both below and above the threshold level is robust with respect to changes in econometric methodology, additional explanatory variables and changes in data frequency.

Hasanov (2011), who examined the possibility of a threshold effect of inflation on economic growth during the period 2000-2009, employed the methodology proposed by Khan and Sendhadji (2001). Estimated threshold model indicate that there is a non-linear relationship between economic growth and inflation in the Azerbaijani economy and threshold level of inflation for GDP growth is 13 percent. Below the threshold level, inflation has a statistically positive effect on GDP growth, but this positive relationship becomes a negative one when Inflation exceeds 13 percent.

Mallik and Chowdhury (2001) showed evidence of a long-run positive relationship between inflation and GDP growth rate for all the four Asian countries, namely, Bangladesh, India, Pakistan and Sri Lanka with significant feedbacks. This was made possible with their use of un-even sample size of 1974-97 for Bangladesh, 1961-97 for India, 1957-97 for Pakistan and 1966-97 for Sri Lanka. The variables used for the paper were CPI and real GDP to measure inflation rates and economic growth, respectively. Accordingly, moderate inflation level helps economic growth but faster growth feedbacks into inflation, thus, the countries are on a "knife-edge".

Drukker et al. (2005) used a non-dynamic panel threshold regression of Hansen (1999) on 138 countries and find an inflation threshold at 19.16 per cent for developing countries, two thresholds for industrial countries, at 2.57 per cent and 12.61 per cent and one threshold for the full sample at 19.16 per cent. For the full sample, the results suggest that inflation below the threshold does not have a statistically significant effect on growth but above the threshold, inflation is detrimental to growth.

Bick (2010) used a modified version of Hansen's (1999) estimation technique that allows for regime intercepts on a balanced panel of 40 developing countries. The findings suggest an inflation threshold of 19.16 per cent when omitting regime intercepts and 12.03 per cent by allowing for regime intercepts. Espinoza et al. (2010) used a panel smooth transition regression model on a sample of 165 countries and find an inflation threshold of around 10 per cent for developing countries and 13 per cent for oil-exporting countries. Their findings confirm the existence of nonlinearities in inflation-growth nexus and the detrimental effects of high inflation,

although at low levels of inflation, the effect of inflation is not consistently statistically significant for all models considered.

All these studies concluded that inflation beyond the threshold is detrimental to growth. However, none has been able to determine the threshold effects of inflation on agricultural growth, hence the focus of this paper.

3. Data and Empirical Method

The pape used panel data for the period 1970 to 2019 from 39 developing countries. All data were sourced from the World Bank Development Indicators database. Agricultural growth (GDPAGR) is proxied by the growth rate of real agriculture, forestry, and fishing, value added. Inflation (INFL) is measured as the percentage change in consumer price index. Other control variables used in the paper are the same as those adapted by Bawa and Abdullahi (2014), and Naseri and Zada (2018), which are foreign direct investment as a percentage of GDP (FDI), domestic credit to the private sector as a percentage of GDP (CREDIT), and urban population as a percentage of total population (URBANIZATION).

We also include the initial income level (INITIAL) measured as the previous value of agriculture value added. The descriptive statistics of these variables are presented in Table 2. All the variables were transformed into their natural logarithm.

Table 1

Summary of Inflation-Growth Studies

Authors	Countries	Period	Variables	Methodologies	Main results
Sarel (1996)	87	1970-1990	GDP, CPI, population, terms of trade, real exchange rate, investment rates and government expenditures	Panel data	Prove that when the existence of the structural break is ignored, the estimated effect of inflation on economic growth for higher inflation rates decreased by a factor of three.
Khan and Senhadji (2001)	140	1960-1998	economic growth, inflation, population, and total investment growth rates	Unbalanced panel dataset	Beyond threshold levels of 3 and 12 per cent for industrialized and developing countries, respectively, the relationship between inflation and economic growth became negative.
Kremer et al. (2013)	124	1950-2004	economic growth, CPI inflation, population, and total investment growth rates and income level	Dynamic panel data threshold model	inflation affected growth when it exceeded 2 per cent threshold for industrial countries and 12 per cent for non-industrial countries, and that below these levels

					the relationship between inflation and economic growth was significantly positive
Akgül and Özdemir (2012)	Turkey	2003-2009	economic growth, inflation, population, and total investment growth rates	TAR model	was seen that inflation rate over the threshold had a negative influence on economic growth
Vinayagathasan (2013)	32	1980-2009	economic growth, inflation, population, and total investment growth rates	Dynamic panel data threshold model	It was determined that while an inflation rate over this threshold had a negative influence on economic growth, an inflation rate below this threshold did not have any influence at all
Aydın et al. (2016)	5	1992-2013	economic growth, inflation, population, and total investment growth rates	Dynamic panel data	An inflation rate above this threshold has a negative influence on economic growth while an inflation rate below this threshold has a positive influence on economic growth.
Gillman et al. (2002)	29 OECD and 18 APEC countries	1961-1997	GDP,Inflation, investment	Panel data	indicate that the reduction of high and medium inflation (double digits) to moderate single-digit figures has a

					significant positive effect on growth for the OECD countries, and to a lesser extent for the APEC countries.
Bawa and Abdullahi (2014)	Nigeria	1981-2009	economic growth, inflation, population, and total investment growth rates	TAR model	Above the threshold level, the magnitude of the negative effect of inflation on growth was high
Hasanov (2011)	Azerbaijani	2000-2009	economic growth, inflation, population, and total investment growth rates	Unbalanced panel data set	threshold level has a significant positive effect on GDP growth, but becomes a negative one when inflation exceeds 13 percent.
Mallik and Chowdhury (2001)	4 Asian Countries	1974-97	CPI and real GDP to measure inflation rates and economic growth	Panel data	moderate inflation level helps economic growth but faster growth feedbacks into inflation, thus, the countries are on a "knife-edge".
Drukker et al. (2005)	138	1950–2000	GDP and inflation	non-dynamic, fixed - effects panel model	inflation is detrimental to growth
Bick (2010)	40			Panel threshold model	The findings suggest an inflation threshold of 19.16% when omitting regime intercepts and 12.03% by allowing for regime intercepts.

Espinoza et al. (2010)	165			Panel smooth transition regression	confirm the existence of nonlinearities in inflation-growth nexus and the detrimental effects of high inflation

Table 2

Summary Statistics

Variables	Mean	Median	Std. Dev.
GDPAGR	2.490	2.878	7.967
INFL	13.553	7.854	29.573
FDI	0.030	0.119	2.008
CREDIT	3.082	3.110	0.794
URBANIZATION	3.621	3.766	0.610
INITIAL	22.030	21.833	1.698

The paper uses a dynamic panel threshold model developed by Kremer et al. (2013) that extends Hansen's (1999) original static setup to endogenous regressors to analyse the threshold effect of inflation on agricultural growth.

This model is an extension of the cross-sectional threshold model of Caner and Hansen (2004), where GMM type estimators are used in order to allow for endogeneity. Consider the following general panel threshold model:

$$y_{it} = \mu_i + \beta_1^{'} z_{it} I(q_{it} \leq \gamma) + \beta_2^{'} z_{it} I(q_{it} > \gamma) + \varepsilon_{it} \quad (1)$$

where subscripts i = 1,...,N represents the country and t = 1,...,T indexes time. μi is the country specific fixed effect and the error term is $\varepsilon it \overset{iid}{\sim} (0,\sigma^2)$. I(·) is the indicator function indicating the regime defined by the threshold variable q_{it} and the threshold level γ. Z_{it} is an m-dimensional vector of explanatory regressors, which may include lagged values of y and other endogenous variables. The vector of explanatory variables is partitioned into a subset z_{1it} , of exogenous variables uncorrelated with ε_{it} , and a subset of endogenous variables z_{2it}, correlated with εit. In addition to the structural equation (1), the model requires a suitable set of k ≥ m instrumental variables xit including z_{1it}.

Following Kreme et al. (2013) and Aye and Edoja (2017), we use the forward orthogonal deviations transformation suggested by Arellano and Bover (1995) to eliminate the fixed effects in the first step of the estimation. The advantage of the forward orthogonal deviations transformation is that it avoids serial correlation of the transformed error terms and hence maintains the distributional assumptions underlying Hansen (1999), and Caner and Hansen (2004). Therefore, instead of first-differencing which leads to serial correlation of the error terms or subtracting the mean from each observation (within transformation) as in Hansen (1999), which could result in inconsistent estimates, the forward orthogonal deviations transformation method subtracts the average of all future available observations of a variable. Therefore, for the error term, the forward orthogonal deviations transformation is given by:

$$\varepsilon_{it}^{*} = \sqrt{\frac{T-t}{T-t+1}}\left[\varepsilon_{it} - \frac{1}{T-t}(\varepsilon_i(t+1) + \ldots + \varepsilon_{iT})\right] \quad (2)$$

Therefore, the forward orthogonal deviation transformation maintains the uncorrelatedness of the error terms, that is

$$Var(\mathscr{E}_i) = \sigma^2 I_T \Rightarrow Var(\mathscr{E}^*_t) = \sigma^2 I_{T\text{-}I}$$

According to Hansen (2000), this ensures that the estimation procedure derived by Caner and Hansen (2004) for a cross-sectional model can be applied to the dynamic panel equation (1). The estimation procedure involves determining and selecting the threshold value γ with the smallest sum of squared residuals. Once $\hat{\gamma}$ is determined, the slope coefficients can be estimated by the generalized method of moments (GMM) for the previously used instruments and the previous estimated threshold ˆ γ.

Applying the dynamic panel threshold model to the analysis of the impact of the threshold effect of inflation on agricultural growth, we specify the threshold model of the agricultural growth-inflation nexus

$$d(GDPAGR)_{2it=}\mu i + \beta_1 INFL_{it}\, I(INFL_{it} \leq \gamma) + \delta_1 I(INFL_{it} \leq \gamma) + \beta_2 INFL_{it}\, I(INFL_{it} > \gamma) + \emptyset z_{it} + \mathcal{E}_{it} \quad (3)$$

$INFL_{it}$ is both the threshold variable and the regime-dependent regressor in our application (z_{it}) denotes the vector of partly endogenous control variables, where slope coefficients are assumed to be regime independent. Following Bick (2010) and Kreme et al. (2013), we allow for differences in the regime intercept(δ_1). Initial GDPAGR is considered as endogenous variable, i.e. z_{2it}= *initial*$_{it}$= GDPAGR$_{2t-1}$, while z_{1it} contains the remaining control variables which, for our application, are Foreign Direct Investment (FDI), CREDIT, and URBANIZATION. We use lags of the dependent variable (*d*GDPAGR$_{2t-1}$, . . . , *dGDPAGR*$_{2t-p}$) as instruments, following Arellano and Bover (1995), Kreme et al. (2013) and Aye and Edoja (2017). There is a bias/efficiency trade-off in finite samples when it comes to the choice of the number *(p)* of instruments. On the one hand, using all the available lags of the instrument variable *(p = t)* may increase efficiency, while

on the other hand, reducing the instrument count to 1 *(p* = 1*)* may avoid an overfit of instrumented variables that might lead to biased coefficient estimates. However, as demonstrated in Kreme et al. (2013), the choice of instruments did not have a significant impact on their results. Hence, we limit our analysis to one lagged of the instrument variable.

4. Results

The results of the relationship between inflation and agricultural growth in developing countries are presented in Table 2. The upper section of the table gives the predicted inflation threshold and confidence interval at 95% confidence level. The mid-section of the table demonstrates the influence of inflation on agricultural growth for both regime types. β_1 indicates the marginal effect of inflation on agricultural growth in low inflation regime, while β_2 indicates the marginal effect of inflation on agricultural growth in high inflation regime. There is a low inflation regime when the inflation rate is below the predicted threshold, and there is a high inflation regime when the inflation rate is above the predicted threshold. As seen in Table 3, the threshold predicted for inflation was found to be 5.997%. While the lower limit for the threshold at 95% confidence level is 5.626%, the upper limit is 6.011%.

Although the obtained threshold here is lower than the 40% proposed by Bruno and Esterlay (1998), it may be considered relatively high. Some reasons could be advanced for the highness of inflation threshold in developing economies. First, developing economies widely use price and interest rate indexation systems as they have long-term inflation experience. These indexation systems systems may have partly reduced the negative influence of inflation (Kremer et al., 2013). The second reason for this may be the convergence process and the Balassa-Samuelson effect (Khan and Senhadji, 2001). This effect suggests that a differentiation between the relative rates of productivity and growth of the tradable and non-tradable goods producing sectors in developing economies may affect changes in the real exchange rate and are able to influence the inflation threshold (Altunöz, 2014).

Table 3 shows that the low regime coefficient is 0.052 while the high regime coefficient takes the value of -0.086, and that there is statistical significance. This demonstrates that inflation has a negative effect on agricultural growth in the high inflation regime while it has a positive marginal effect on economic growth in the low inflation regime. In other words, while an inflation

rate above the threshold has a negative influence on agricultural growth, an inflation rate below the threshold has a positive influence on it. Considering regime coefficients in terms of magnitude, it is clear that inflation has a stronger influence on agricultural growth in the high inflation regime.

The effect of initial income is negative and significant. The value of initial income (-0.063) implies that agricultural growth is corrected by about 0.06% each year. Foreign direct investment (-0.006) is also negative albeit not significant. Domestic credit to the private sector (0.035) is positive and significant, confirming the importance of financial development for the agriculture sector growth. Domestic credit to the private sector exerts significant positive effects on inflation. This implies that increasing domestic credit to the private sector would lead to an increase in agricultural growth. Urbanization (-0.213) is negative and significant. This may not be surprising given that having more of the economy's population in the urban sector may connote having fewer citizens participating in agriculture, which is mainly rural based.

Table 3

Inflation Thresholds and Agricultural growth

Variables	Coefficient	Std. Error
Threshold estimate:		
$\hat{\gamma}$	5.997	
95% confidence interval	[5.626–6.011]	
Impact of inflation:		
$\widehat{\beta_1}$	0.052**	0.023
$\widehat{\beta_2}$	-0.086***	0.032
Impact of covariates:		
INITIAL	-0.063***	0.018
FDI	-0.006	0.022
CREDIT	0.035**	0.016
URBANIZATION	-0.213***	0.076
$\widehat{\delta_1}$	0.603*	0.324

5. Conclusion

The paper investigated the threshold effect of inflation on agricultural growth, using evidence from developing countries. To this end, a dynamic panel threshold model developed by Kremer et al. (2013) that extends beyond Hansen's (1999) original static setup to endogenous regressors was used in the present paper. The paper tried to determine the level at which inflation turn from good to bad.

Moreover, the paper examined how the inflation experienced in the developing countries affects agricultural growth. The obtained findings aver that there is a significant relationship between inflation and agricultural growth. In addition, when the inflation rate is above a specific critical value in these countries, inflation will negatively influence the agricultural growth.

The predicted critical value was found to be 5.997 per cent for the investigated panel of developing countries. This result supports the view that a moderate inflation rate below the threshold has a positive influence on economic growth. This finding does not indicate any causal relationship between inflation and economic growth. It just shows the existence of a relationship.

On the other hand, this paper indicates the importance of the inflation threshold between inflation and agricultural growth. This paper may be built upon in future research especially in the context of individual countries as this may help the monetary authority to establish reliable inflation targets.

References

Aye, G.C. and Edoja, P.E. (2017), Effect of Economic Growth on CO2 Emission in Developing Countries: Evidence from a Dynamic Panel Threshold Model. *Cogent Economics & Finance*, 5(1), 1-22.

Abramovitz, M. (1956), Resource and Output Trends in the United States since 1870. *American Economic Review: Papers and Proceedings*, 46, 5-23.

Ahortor, C.R.K., Adenekan, A., and Ohemeng, W. (2011), An Estimate of Inflation Threshold in the WAMZ: The Case of Ghana and Nigeria. *West African Journal of Monetary and Economic Integration,* 11(2), 158-201.

Akgül, I. and Özdemir S. (2012), Inflation Threshold and the Effects on Economic Growth. *İktisat İşletme ve Finans Dergisi*, 27(313), 85-106.

Arellano, M. and Bover, O. (1995), Another Look at the Instrumental Variables Estimation of Error-Components Models, *Journal of Econometrics*, 68, 29-51.

Aydın, C., Esen, Ö., and Bayrak, M. (2016), Inflation and Economic Growth: A Dynamic Panel Threshold Analysis for Turkish Republics in Transition Process. *Procedia-Social and Behavioral Sciences*, 229, 196-205.

Bick, A. (2010), Threshold Effects of Inflation on Economic Growth in Developing Countries. *Economics Letters*, 108(2), 126-129.

Caner, M. and Hansen, B. E. (2004), Instrumental Variable Estimation of a Threshold Model. *Econometric Theory*, 20, 813-843

Drukker, D., Gomis-Porqueras, P. and Hernandez-Verme, P. (2005), Threshold Effects in the Relationship between Inflation and Growth: A new panel-data approach, MPRA Working Paper Series, No. 38225.

De Gregorio, José, (1996), Inflation, Growth and Central Banks. The World Bank, Policy Research Working Paper, 1575.

Eggoh, J.C. and Muhammad, K. (2014), On the Nonlinear Relationship between Inflation and Economic Growth. *Research in Economics*, 68(2), 133-143

Espinoza, R., Leon, H. and Ananthakrishnan, P. (2010), Estimating the Inflation-Growth Nexus-A Smooth Transition Model. IMF Working Paper, WP/10/76.

Fischer, S. (1983), Inflation and growth. NBER Working Paper, No 1235.

Friedman, M. (1969), The Optimum Quantity of Money in The Optimum Quantity of Money, and Other Essays. Chicago: Aldine Publishing Company, 1969.

Gillman, M., M. Harris and L. Matyas (2002), Inflation and Growth: Some Theory and Evidence. Berlin: 10th International Conference on Panel Data.

Hasanov, F. (2011), Relationship between inflation and economic growth in Azerbaijani economy: Is there any threshold effect?. *Asian Journal of Business and Management Sciences*, 1(1), 1-11.

Hansen, B. E. (1999), Threshold Effects in Non-Dynamic Panels: Estimation, Testing, and Inference, *Journal of Econometrics*, 93, 345–368.

Hansen, B. E. (2000), Sample Splitting and Threshold Estimation. *Econometrica*, 68(3), 575-603.

Kakwani, N (1993), Statistical Inference in the Measurement of Poverty. *A Review of Economics and Statistics*, 75(4), 632-639.

Khan, M. S. and Ssnhadji, A. S. (2001), Threshold Effects in the Relationship between Inflation and Growth, IMF Staff Papers, 48(1), 1-21.

Kremer, S., Bick, A. and Nautz, D. (2013), Inflation and Growth: New Evidence from a Dynamic Panel Threshold Analysis. *Empirical Economics*, 44(2), 861-878.

Kremer, S., Bick, A., Nautz, D. (2009), Inflation and Growth: New Evidence from a Dynamic Panel Threshold Analysis. SFB 649 Discussion Paper, Humboldt University, Berlin, Germany.

Mallik, G. and Chowdhury, A. (2001), Inflation and Economic Growth: Evidence from Four South Asian Countries. *Asia-Pasific Development Journal*, 8 (1), 123-135.

Mundell, R.A. (1965), Growth, Stability and Inflationary Finance. *The Journal of Political Economy*, 73(2), 97-109

Naseri, M., and Zada, N. (2013), Effect of Inflation on Economic Growth: Evidence from Malaysia.

Ravallion, M. and Datt, G. (1996), How Important to India's poor is the Sectoral Composition of Economic Growth. *The World Bank Economic Review*, 10(1), 1-25

Sarel, M. (1996), Nonlinear Effects of Inflation on Economic Growth. Technical Report, IMF Staff Papers, 1996.

Seleteng, M., Bittencourt, M. and van Eyden, R. (2013), Non-linearities in Inflation-Growth Nexus in the SADC Region: Panel Smooth Transition Regression Approach. *Economic Modelling*, 30, 149-156.

Sidrauski, M. (1967), Rational Choice and Patterns of Growth in a Monetary Economy. *American Economic Review*, 57, 534-544.

Soloaga, I. (2006), Agricultural Growth and Poverty Reduction: The Case of Mexico. International Association of Agricultural Economists Conference, Gold Coast, Australia, August 12-18, 2006.

Solow, R.M. (1956), A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics,* 70 (1), 65-94.

Solow, R. M., (1957), Technical Change and the Aggregate Production Function. *Review of Economics and Statistics,* 39, 312-320.

Stockman, A.C., (1981), Anticipated Inflation and the Capital Stock in a Cash-in-Advance Economy. *Journal of Monetary Economics*, 8, 387-393.

Swan, T. W. (1956), Economic Growth and Capital Accumulation. *Economic Record,* 32, 34-361.

Thang, N and L.D. Trung, V.H. Dat and N.T. Phuong (2006), Poverty, poverty reduction and poverty dynamics in Vietnam. Background paper for Second Chronic Poverty Report, Chronic Poverty Research Centre, University of Manchester, Manchester: UK.

Thorbecke, E., and Hong-Sang J. (1996), A Multiplier Decomposition Method to Analyze Poverty Alleviation. *Journal of Development Economics*, 48, 279-300.

Tobin, J., (1965), Money and Economic Growth. Econometrica, 33, 671-684.

Vinayagathasan, T. (2013), Inflation and Economic Growth: A Dynamic Panel Threshold Analysis for Asian Economies. *Journal of Asian Economics*, 26, 31-41.

Xiao, J., (2009), The Relationship between Inflation and Economic Growth of China: Empirical Study from 1978 to 2007. Master's Thesis, Lund University.