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Fresh Insight on the Determinants of Economic Growth with Focus on Inflation-Growth Nexus: Evidence from Developing Countries

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ABSTRACT

This study is the empirical effort of inquiring the link between inflation and economic growth in the context of other factors determining economic growth in selected developing countries. While utilizing Generalized Method of Moments (Difference and System GMM), the study found an inverse insignificant connection between inflation and economic growth. Furthermore, the sample developing countries tend to have highly positively evaluated by their lagged economic growth as well as the government consumption expenditures and agriculture sector productivity and all of these are having robust role on economic growth. Additionally, the economic impact of trade openness and money supply is mixed and even significant in some cases designating that developing countries can improve their economic growth through financial and trade development. These findings help rethink economic policy makers in developing countries for following inflation targeting policies and to utilize their public developmental expenditures to improve their primary sector (agriculture) productivity in order to enhance economic growth.

1. INTRODUCTION

A high and sustained economic growth along with low and stable inflation are often considered among the major goals of macro-economic stabilization policies. Importantly, Price level stability is carrying significant role in defining the stable economic growth rate. Hereafter, the central monetary authorities of many developing countries exercise monetary policy to ensure low and stable inflation for maintaining sustained economic growth. From the well-established view, it is pertained that though higher inflation badly affects the economy. However, there is also some empirical evidence that moderate inflation also slows down economic growth (see for example, Little et al., 1993; Temple, 2000). Conversely, some studies such as Aiyagari (1990) along with Cooley & Hansen (1991) evidenced that the cost of pulling down inflation to zero is far above than its contribution.

Considering the ongoing global economic slowdown and emerging financial crises, developing countries are mostly affected from macroeconomic fluctuations and they are experiencing slow and stagnant economic growth. More chronically, they have to rely on international financial institutions such as World Bank; International Monetary Fund and other regional financial institutions (eg. Asian Development Bank) in order to run their economies.

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If on one hand, these less developed countries have aimed to reduce inflation and increase economic growth, then on the other hand, these different global financial agencies have also come up with the main objective of reducing prices, in many cases along with expediting economic growth in these countries. More emphasis has been put on the low and stable inflation for ensuring desirable economic growth since after the emergence of Covid-19 and the resultant global economic shutdown. Thus, recently, the policy makers around the world in general and specifically in backward countries makes it necessary to determine the long-term determinants of economic growth as well as to explore the impact of inflation on economic growth particularly in developing countries.

Keeping this in mind, here, we consider only developing countries having the same macroeconomic characteristics. Thus, the central theme of the present research is to inspect the macroeconomic determinants of economic growth model and to dig-out the impact of inflation on economic performance in a large sample of developing countries through advanced econometric techniques. The motivation of this study comes from the ongoing return of inflation globally and in developing world particularly. The present need of the macroeconomic policy makers is illustrated from the fact that the less developing countries are a special risk to increased prices along with reduced economic growth. The current slogan of policy makers also attempt to search out the major factors determining the growth process in less developed countries. Thus, this study is a fresh insight to search the sources of economic growth and to show whether inflationary trend is detrimental to economic growth or not.

The remaining study is arranged as below: next section begins with the theoretical as well as empirical literature on the effect of inflation on economic growth. In the next part, the rationale for selection of variables and data sources for the study is outlined followed by the econometric methodology for the model and empirical steps for the GMM approach used in this study in section fourth. Further the estimation results and discussions including major findings are discussed at the next section followed by conclusions of the study in the last part of the given study.

Theoretical & Empirical Literature

In recent times, there exists a flood of theoretical along with empirical findings on the inflation-growth nexus. The existing results of present studies have been mixed often and these research studies can be simply classified into four possible predictions. The first evidence illustrates zero effect of inflation on economic growth (e.g., Cameron, Hum & Simpson (1996) and the studies therein). The second opinion lies for a positive relationship between inflation and economic growth (see for example, Malik and Chowdhuary (2001) and Tobin (1965)). In contrast, another research argument explores that inflation puts a negative effect on growth (e.g., Stockman (1981); Friedman (1956); Gylfason (1991); Andres and Hemando (1997), De Gregorio (1992), Barro (1996) & Saeed (2007)). The last of the four types of studies find out for a nonlinear correlation of inflation and growth. Additionally, the collaboration in the context of inflation and output growth is optimistic or non-existent under some threshold, still it influences the economy when it surpasses that threshold (see, Fischer, 1993)).

From the above comprehensive literature on inflation – growth nexus and the relevant occurring of different levels of inflation on macroeconomic outcomes including economic growth, it is derived that economic literature is having a long history on the relationship on account of the twin macroeconomic fundamentals such as inflation and economic growth and there is lack of consensus among the researchers and relevant empirical studies on the prevailing inflation-growth phenomena and the scene is further challenging in research when it comes to different regions and countries. The situation further evidences of different resulting outcomes when it comes to developing countries. Thus, while considering the recent inflationary shocks including the food price shocks, oil shocks, financial shocks and hence the resulting logistic leakages on account of the recent past global pandemic, it is imparting to dig out the real story of inflation-growth nexus and to search out the resulting factors contributing towards modern economic growth. Consequently, this paper is an endeavour to uncover the research issue in the context of relatively less developed counties and to suggest policy options in order to escape them from the emerging inflationary and recessionary shocks.

2. EMPIRICAL FRAMEWORK

To analyse the effects of inflation along with other controlled variables like government consumption expenditures, money supply, openness and share of agriculture sector, the given dynamic panel specification on account of inflation-growth is presented as.

$$\Delta Y_{it} = f(x) = \beta_0 + \beta_1 Y_{it-1} + \beta_2 X_{it} + \beta_3 Z_{it} + \varphi_i + \gamma_t + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

For $i = 1, \ldots\ldots\ldots, N$ and $t = 1, \ldots\ldots, T$

Where ΔY_(it) is the growth of real GDP of country “i” at time “t”. In addition, X_it is inflation rate and Z_it includes our variables of interest: government consumption expenditures, financial sector development, trade openness and agriculture sector contribution towards GDP. φ_(i)is the unobserved country-specific and γ_t stands for unobserved productivity effect. Finally, ε_it carries the unobserved effects.

Equation (1) may not be estimated reliably using the simple ordinary least square (OLS) due to the existence of endogeneity problem. Thus considering the estimation issues, we utilize the system GMM of Arrelano and Bover (1995) and Blundell and Bond (1998) along with difference GMM to estimate the above equation. Thus, our empirical models becomes as:

$$Growth_{it} = \beta_0 + \beta_1 Growth_{it-1} + \beta_2 Inflat_{it} + \beta_3 M2/GDP_{it} + \beta_4 GOVCON_{it} + \beta_5 OPEN_{it} + \beta_6 SAGR_{it} + v_i + \mu_{it} \quad (2)$$

Where GROWTH are the growth rates of the real GDP while INFLAT is the inflation rates at consumer prices, M2/GDP is the ratio of broad money to GDP, OPEN is economic openness, GOVCON is the government consumption expenditures and SAGR is the share of agriculture sector to GDP. In addition, we use the one lag of the dependent variables as it is commonly observed that the macroeconomic characteristics of developing countries are highly affected by the lag year’s economic activities. We chose both one step as well as two-step system GMM strategy along with robust standard errors.

Data, Variables and Summary Statistics

All data are taken from the World Development Indicators (WDI) for the period 1983–2020 of all 50 developing countries while considering the available data. We have taken a 5-years average for each variable in order to reduce fluctuations in the data and also our data is balanced data.

Additionally, the present study emphasises on real growth of Gross Domestic Product (GDP) as dependent variable and it is based on a number of other macroeconomic variables including trade and fiscal-monetary variables along with lagged feedback from GDP. Our selected growth-enhancing variables are: Inflation such as (CPI ((±)), financial development measured by broad money to GDP (M2/GDP (±)); trade openness-the ratio of import plus export to GDP (OPEN (±)), government expenditures (GOVCON (±)) and share of agriculture to GDP (SAGR (+)).

It is expected that price fluctuations may have significant impact on small open economies, though the literature is full of mixed results as outlined at the relevant literature section. The role of trade openness in developing countries is quite important; therefore we have included the trade openness as factor determining economic growth. This study considers government consumption expenditure and trade as the direct role of government consumption expenditures and trade components on GDP. We have used logarithms of the variables in order to show the percentage changes of control variables so that estimated outputs may be inferred as elasticities.

3. ESTIMATED RESULTS & DISCUSSIONS

The summary statistics of the mentioned variables growth for the period 1983-2020 in Table 1. We observe that in general, inflation is significantly less volatile than economic growth over the period. The growth rates of financial deepening as well as government consumption are 2% and 9%, respectively. In addition, trade openness on average is around 2%, and agricultural share is 9%.

Table 1
Descriptive Statistics of growth rates of variables, 1983-2020

Variable	Obs.	Mean	Standard dev	Min	Max
Economic growth	294	10.270	0.838	8.312	12.581
CPI inflation	279	0.906	0.493	-0.590	3.007
M2/GDP	287	1.536	0.254	0.879	2.243
Trade Openness	292	1.769	0.244	1.108	2.321
Agriculture-GDP	288	9.389	0.706	7.597	11.533

In order to illustrate whether there exists any sort of correlation among the selected variables, we perform the correlation tests. Thus, the next table presents the correlation matrix of selected variables. As per conventional wisdom, there is an increasing correlation in government consumption expenditures and agriculture sector to economic growth. Additionally, there exists a very less positive association between our variables of interest such as inflation and economic growth. Finally, there is also significant long run correlation between share of agriculture and economic growth.

Table 2
Correlation Matrix of variables

	Growth	CPI-INF	M2-GDP	GOVCONS	Openness
Growth	1.00				
CPI-INFO	0.11	1.00			
M2-GDP	0.34	-0.21	1.00		
GOVCONS	0.97	0.14	0.39	1.00	
Openness	-0.33	0.19	0.25	-0.28	1.00

We use the one-step estimator as well as the two-steps estimator along with their robust standard errors to produce and compare the meaningful results. The below table: 3 provides results by utilizing the Arellano-Bond Dynamic Panel-data estimation (Difference GMM). The table 3 presents the results of Panel-data estimation (Difference GMM) by including the first difference of the three controlled variables such as money supply indicating financial development, trade openness and share of agriculture sector. As in case of developing countries, the lagged values of these variables carry contributions on economic growth and other macroeconomic variables. The given table presents their results.

Table 3
Results of Arellano-Bond dynamic Panel-data estimation (Difference GMM)

	Dependent variable is real GDP growth			
Variables	**One-step Difference GMM**	**One-step Difference GMM with robust SE**	**TWO-step Difference GMM**	**TWO-step Difference GMM with robust SE**
Constant	-0.247 (-0.48)	-0.247 (-0.76)	-0.394 (-1.30)	-0.394 (-1.09)
$lnRGDP_{it-1}$	1.050*** (8.85)	1.051*** (6.49)	1.031*** (6.92)	1.031*** (4.920)
$lnRGDP_{it-2}$	-0.169*** (-3.38)	-0.169*** (-3.04)	-0.156*** (-3.03)	-0.156** (-2.25)
lnCPI	-0.011 (-1.10)	-0.011 (-0.98)	-0.001 (-0.09)	-0.001 (-0.07)
lnM2	-0.137** (-2.19)	-0.136** (-2.27)	-0.123** (-2.21)	-0.123 (-1.76)
ΔlnM2	0.119** (2.85)	0.119*** (3.03)	0.113*** (3.25)	0.113** (2.58)
lnGOVCON	0.073 (1.50)	0.073 (1.17)	0.080 (1.33)	0.080 (0.81)
lnOPEN	0.101* (1.86)	0.101 (1.87)	0.084* (1.67)	0.084 (1.25)
ΔlnOPEN	-0.106** (-2.16)	-0.106* (-1.83)	-0.110** (-2.11)	-0.110* (-1.81)
lnSAGR	0.092 (1.13)	0.092 (0.87)	0.109 (1.19)	0.109 (1.03)
ΔlnSAGR	0.473*** (5.69)	0.473*** (4.32)	0.486*** (5.41)	0.486*** (4.60)
Sargan Test	8.137 (0.3206)	-	6.168 (0.5202)	-
AR(1)	-	-2.189 (0.028)	-2.1022 (0.035)	-1.923(0.054)
AR(2)	-	-0.276 (0.782)	-0.1423 (0.886)	-0.131(0.895)
Wald Test	2489.20(0.000)	2378.25(0.000)	2844.63(0.000)	2270.19(0.000)
N	50	50	50	50

Notes: Estimation is based on Arellano and Bond dynamic panel GMM estimations (Stata xtabond command). In addition, RGDP= Real GDP (in US dollars, constant at 2005 prices), CPI= Inflation, Consumer prices (annual %), M2= Money as % of GDP, GOVCON= General government final consumption expenditure (constant 2005 US$), OPEN= Total imports plus exports/GDP), SAGR= Share of Agriculture sector, value added (constant 2005 US$). Figures in parentheses are the t-statistics. ***,** and * designate significance at 1%,5% and 10% respectively. "Δ" indicates the first difference of the variable.

The table 3 provides results by utilizing the results of Arellano-Bond dynamic Panel-data estimation (Difference GMM). The results of one step difference GMM and two steps difference GMM reveal that the first lags of the dependent variable (RGDP), money supply and share of agriculture sector are statistically positively significant at 1% and the second lag of the dependent variable (RGDP) and first lag of openness are negatively significant at 1% and 5% respectively. Checking the robustness, we get nearly the same results except for openness and Money supply which are not significant at two steps with robust SE. The CPI and the government consumption expenditures are not significant. The post estimation diagnostic checks show that the estimation results are in line with GMM. The results are robust as proved by the post-regression diagnostic tests.

Table 4
Results of Arellano-Bond dynamic panel-data estimation (Difference GMM) with Time dummies

	Dependent variable is real GDP growth			
Variables	**One-step Difference GMM**	**One-step Difference GMM with robust SE**	**TWO-step Difference GMM**	**TWO-step Difference GMM with robust SE**
Constant	1.880** (2.58)	1.880** (1.97)	1.435* (1.90)	1.435 (1.29)
$lnRGDP_{it-1}$	0.752*** (6.87)	0.752*** (4.56)	0.819*** (5.49)	0.819*** (4.01)
$lnRGDP_{it-2}$	-0.156*** (-3.54)	-0.156*** (2.99)	-0.158*** (-3.14)	-0.158** (-2.32)
lnCPI	-0.002 (0.19)	-0.002 (-0.20)	0.005 (0.71)	0.005 (0.50)
lnM2	-0.073 (-1.42)	-0.073 (-1.33)	-0.098** (-2.16)	-0.0950 (-1.58)

Δ*lnM2*	0.086** (2.40)	0.086*** (2.82)	0.098*** (3.77)	0.098*** (2.92)
lnGOVCON	0.109*** (2.76)	0.109** (2.17)	0.092* (1.94)	0.092 (1.46)
lnOPEN	0.028 (0.58)	0.028 (0.54)	0.064 (1.41)	0.064 (1.15)
Δ*lnOPEN*	-0.085** (-1.99)	-0.085* (-1.73)	-0.099** (-2.23)	-0.0997 (-1.57)
lnSAGR	0.146** (2.16)	0.146* (1.65)	0.136* (1.67)	0.136 (1.20)
Δ*lnSAGR*	0.345*** (4.66)	0.345*** (4.03)	0.354*** (4.40)	0.354*** (2.73)
Sargan Test	7.857 (0.345)	-	9.468 (0.220)	-
AR(1)	-	-1.50 (0.132)	-1.750 (0.080)	-1.37 (0.168)
AR(2)	-	3.632 (0.716)	-0.022 (0.982)	-0.019 (0.984)
Wald Test	3458.16 (0.000)	2188.55 (0.000)	3159.90 (0.000)	2096.00 (0.000)
N	50	50	50	50

Notes: See note under the table no:3

The above table provides results while utilizing the Arellano-Bond dynamic Panel-data estimation (Difference GMM). The results of one step difference GMM and two steps difference GMM reveal that the first two lags of the dependent variable (RGDP), money supply and share of agriculture sector are statistically positively significant at 1% and the second lag of the dependent variable (RGDP) and first lag of openness are negatively significant at 1% and 5% respectively. Checking the robustness, we get nearly the same results except for openness and Money supply which are not significant while money supply is negatively significant at two steps difference GMM at 5% level of significance. The post estimation diagnostic checks show that the estimation results are in line with GMM.

Table 5
Results of Blundell-Bover System GMM Panel Data Estimation

Variables	One-step Difference GMM	One-step Difference GMM with robust SE	Two-step Difference GMM	Two-step Difference GMM with robust SE
Constant	0.053 (0.16)	0.053 (0.18)	-0.254 (-1.03)	-0.254 (-0.70)
$\ln RGDP_{lt-1}$	0.964*** (9.96)	0.964*** (6.84)	0.931*** (7.89)	0.931*** (4.85)
$\ln RGDP_{lt-2}$	-0.196*** (-4.21)	-0.196*** (-3.48)	-0.139*** (-2.95)	-0.139** (-2.07)
lnCPI	-0.008 (-0.98)	-0.009 (-0.73)	-0.001 (-0.19)	-0.001 (-0.12)
lnM2	-0.074* (-1.66)	-0.075 (-1.41)	-0.091** (-2.22)	-0.090 (-1.49)
ΔlnM2	0.101*** (2.77)	0.100*** (2.85)	0.088*** (3.25)	0.088** (2.00)
lnGOVCON	0.078* (1.76)	0.078 (1.30)	0.092 (1.65)	0.092 (0.89)
lnOPEN	0.152*** (4.08)	0.152** (2.49)	0.106** (2.31)	0.106* (1.65)
ΔlnOPEN	-0.152*** (-4.08)	-0.152** (-2.41)	-0.123*** (-3.50)	-0.123** (-2.45)
lnSAGR	0.157** (2.54)	0.157* (1.93)	0.161*** (2.75)	0.161 (1.62)
ΔlnSAGR	0.439*** (5.98)	0.439*** (4.44)	0.427*** (5.53)	0.427*** (4.51)
Sargan Test	15.016(0.182)	-	11.804(0.378)	-
AR(1)	-	-2.073(0.038)	-1.913(0.055)	-1.658(0.097)
AR(2)	-	-0.6263(0.531)	-0.541(0.588)	-0.503(0.614)
Wald Test	6200.76 (0.000)	8532.46 (0.000)	3783.76 (0.000)	4246.59 (0.000)
N	50	50	50	50

Notes: See note given the end of table 3.

The above table provides results through utilizing the Blundell-Bover dynamic Panel-data estimation (System GMM) with the 1st difference of money supply, openness and share of agriculture sector. The results of one-step difference GMM and two-steps difference GMM along their robustness reveal that the first two lags of the (RGDP), first difference of money supply, openness and share of agriculture sector are statistically positively significant at 1% except the second lag of the dependent variable and the first difference of openness which are negatively significant at 1%. Checking the robustness, we get nearly the same results except for openness and Money supply and share of agriculture sector which are significant at their robustness. Agriculture sector is also significant at 5%, 10%, and 1% at one-step System GMM, one-step system GMM with robust SE and two-steps system GMM respectively. Government consumption expenditures are significant at 10% by the one step system GMM. Post estimation diagnostic checks show that the estimation results are in line with GMM

Table 6
Results of Blundell-Bover System GMM Panel Data Estimation WITH TIME DUMMIES

Variables	One-step System GMM with time dummies	One-step System GMM with robust SE and time dummies	TWO-steps System GMM with time dummies	TWO-steps System GMM with robust SE and time dummies
Constant	0.473 (1.22)	0.473 (0.98)	0.457 (1.30)	0.457 (0.60)
$lnRGDP_{it-1}$	0.834*** (9.13)	0.834*** (6.96)	0.901*** (8.30)	0.901*** (5.11)
$lnRGDP_{it-2}$	-0.167*** (-3.72)	-0.167*** (-3.01)	-0.1713*** (-3.67)	-0.171** (-2.18)
lnCPI	-0.012 (-1.25)	-0.012 (-1.00)	-0.000 (-0.02)	-0.000 (-0.01)
lnM2	-0.052 (-1.23)	-0.052 (-0.93)	-0.092** (-2.30)	-.092 (0-1.50)
ΔlnM2	0.083** (2.40)	0.083*** (2.64)	0.079*** (3.44)	0.079** (2.19)
lnGOVCON	0.125*** (3.08)	0.126** (2.38)	0.110** (2.19)	0.110 (1.44)
lnOPEN	0.046 (0.94)	0.046 (0.89)	0.056 (1.22)	0.056 (1.00)
ΔlnOPEN	-0.086* (-1.96)	-0.086 (-1.57)	-0.069* (-1.68)	-0.069 (-1.18)
lnSAGR	0.194*** (3.31)	0.194** (2.46)	0.148** (2.12)	0.148 (1.14)
ΔlnSAGR	0.362*** (5.00)	0.362*** (3.92)	0.311*** (4.27)	0.311*** (2.88)
Sargan Test	15.709 (0.152)	-	11.479 (0.404)	-
AR(1)	-	-1.948 (0.051)	-1.806 (0.070)	-1.806 (0.070)
AR(2)	-	-0.116 (0.907)	-0.600 (0.548)	-0.600 (0.548)
Wald Test	7112.33 (0.000)	4203.87 (0.000)	11002.52 (0.000)	4335.00 (0.000)
N	50	50	50	50

The above table provides results by regressing real GDP growth by utilizing the Blundell-Bover System GMM with the first difference of money supply, openness and share of agriculture sector and including time dummies. The results of one-step difference GMM and two-steps difference GMM along their robustness reveal that the first two lags of the dependent variable (RGDP), first difference of money supply and share of agriculture sector are statistically positively significant at 1% except the second lag of the dependent variable which is negatively significant at 1% level of significance. Checking the robustness, we get nearly the same results except for openness and Money supply which are negatively significant at 1% and 5% respectively. The one step system GMM and two steps system GMM along with the robustness of the one step system GMM document that the share of agriculture sector is positively significant at 1% and 5% respectively. The same result occurs for the government consumption expenditures. The post estimation diagnostic checks show that the estimation results are in line with GMM. Importantly, we observe that our model is well fitted while checking the concerned diagnostics.

4. CONCLUSION

From the existing literature, it is evident that the nexus between the rate of inflation and economic growth has long lasted a central debate in macroeconomics research. While performing a fresh insight on such nexus, we investigated the inflation-growth nexus in the context of other determinants of economic growth for selected developing countries. This study provides an empirical enquiry through utilizing panel estimation techniques such as Difference GMM and System GMM for a large sample of 50 developing countries over a longer period of time. Our estimated findings from both the given econometric analyses show that the empirical dilemma between the two variables such as inflation and economic growth is mixed. However, our interest lies whether inflation is exacerbating real economic activity or not. Here our findings suggest that in case of significant relationship between the two variables is that inflation affects growth negatively as we observe from our GMM results in case of developing countries. Moreover, we find that less developing countries tend to have highly positively evaluated by their lagged growth pattern. In addition, the government consumption expenditures and share of agriculture sector also accelerating economic growth in these countries. Besides, the impact of trade openness and financial development is mixed and significant in some cases indicating that developing countries can attain economic growth through financial and trade development. However, our econometric results reveal that financial deepening and trade sector are having adverse impact (in some cases favourable impact) of the corresponding growth of developing counties with the assumption that country-specific conditions matter. Overall, our estimated results confirm that inflation is negatively affecting economic growth depending on the performance of other controlled variables for output growth.

The policy implications arising from this study firstly affirm that macroeconomic policy makers in developing countries should accelerate their public developmental expenditures and to improve their primary sector (agriculture) productivity. These conclusions also help for the reconsideration on account of macroeconomic policy making in developing countries regarding inflation targeting policies. The study argues for governmental consumption expenditures, financial deepening and promoting agriculture sector along with pursuing an obstructive policy of low plus stable inflation in order to safeguard the economy from the devastating effects of higher and variable inflation in these countries.

Conflict interests

The authors declare no conflict of interest.

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