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THE BUSINESS CYCLES IN THE PHILIPPINES: A CHARACTERIZATION

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This paper provides an overall characterization of the Philippine business cycles covering the period 1981 to 2003 in terms of volatility, co-movement and persistence. The period under investigation brought about three cycles: 1983-1989, 1989-1997 and 1997-2000 with initially very erratic but over time smoother fluctuations.

In resemblance with industrialized economies, investment turns out to be the most volatile and consumption the least volatile national expenditure component, potentially pointing at Keynes' assertion of "animal spirits" of investors as the source for the former phenomenon. Further, with the exception of prices, inflation and the terms of trade, all variables have strong and positive correlations with GDP. The strong negative price-output correlation and the weak positive inflation-output correlation identify supply shocks as the triggering factor for observed business cycles, pointing at either technological change or drastic changes in the weather as possible spurring factors. Moreover, the investigation clearly reveals procyclical fiscal and monetary policy interventions, contradicting theoretical prescriptions of countercyclical stabilization policies to swiftly overcome economic recessions. Finally, all key macroeconomic variables show fairly low persistence, substantiating the Philippines' popularity for its boom-bust cycles.

I. INTRODUCTION

Economies constantly undergo significant cyclical variations of distinct pattern and origin with differences in depth and length. In duration, business cycles vary from more than 1 year to 12 years, and comprise a boom (or expansionary phase) and a recession (or contractionary phase). Recessions are characterized by high unemployment and low productivity with highly asymmetric short but sharper cycles. Business cycles represent costly regularities of modern economies. Given the welfare costs associated with economic downturns, stabilization policies become a vital concern of the government that aim to minimize the pains of recessions and initiate an early economic recovery. In order to design appropriate and effective policies, the basic characteristics and potential origins of the business cycle need to be identified and understood.

This paper will provide an overall picture of the Philippine business cycle covering the period 1981 until 2003. The cycle will be characterized in terms of volatility, co-movements and persistence. The paper will also identify the potential sources of observed macroeconomic fluctuations and determine the role of stabilization policies in arresting these fluctuations.

This paper is organized as follows: Section I discusses the methodology applied to extract the business cycle component from observed macroeconomic time series, Section II gives a brief description of business cycles in developing countries,

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Section III reports basic characteristics of the Philippine business cycle for the period 1981 to 2003, while Section IV provides the research findings and conclusion.

II. METHODOLOGY

The study of business cycle begins with the processes of detrending key macroeconomic variables. From there, information can be extracted to provide an overall picture of the cycle's basic characteristics – volatility, persistence and co-movements. The literature offers numerous detrending or smoothing procedures which includes first differencing, band-pass filters (Baxter and King, 1999) and Hodrick-Prescott (HP) filters (Hodrick and Prescott, 1997). The latter is the most frequently applied trend-cycle decomposition technique but has its shortcomings (see Ravn and Uhlig, 1997 and Cogley and Nason, 1995 for a comprehensive discussion). The Hodrick Prescott filter decomposes a time series y_t into a cyclical y_t^c and a growth component y_t^g. It solves the minimization problem for y_t^g:

$$\min_{\{y_t^g\}_{t=0}^{\infty}} \sum_{t=1}^{\infty} \left\{ \left(y_t - y_t^g\right)^2 + \lambda \left[\left(y_{t+1}^g - y_t^g\right) - \left(y_t^g - y_{t-1}^g\right) \right]^2 \right\}$$

where λ is the smoothing parameter. A high value of λ implies a smooth trend component and an erratic cyclical component, while the reverse is true for lower values of λ. After Burns' and Mitchell's influential work on pre-second world war U.S. business cycle regularities, the length of the business cycles were widely accepted to vary between 1½ and 8 years. Consequently, filters were specified to cut off components at higher or lower frequencies in order to capture better the cyclical component.

Rand and Tarp (2001) observed that business cycles in developing countries, as opposed to cycles in industrialized countries, are significantly shorter in duration. This necessitates the adjustment of the smoothing parameter where extra care must be taken in choosing the optimal λ (Pedersen, 1998). A lower value is analogous to shorter cycles since a larger part of the low frequency movements are filtered away. Since the filter eliminates the secular trend component, the cyclical components of the observed time series should be tested for stationarity to ensure that any long term trend is eliminated. To do this, the augmented Dickey-Fuller unit root test was first applied to all original data variables as shown in the first column of Table 1. Apart from inflation, all variables appear non-stationary and call for detrending for further analysis. Columns 2 to 7 show the results of the augmented Dickey-Fuller tests for different λs, 6.25, 10 and 100 and the respective p-value of significance and, hence, represent the rationale for choosing 6.25 for the analysis.

Thus, after detrending the series, basic characteristics can be inferred:

Volatility assesses the amplitude of fluctuations and indicates the magnitude of the variable's contribution, and its sensitivity, to aggregate fluctuations. This is measured by the standard deviation, where a low standard deviation implies the variable does not contribute much to aggregate fluctuations.

Co-movements with contemporaneous output series indicate the cyclicality of key macroeconomic variables like private consumption, investment, government expenditures, and money supply. These are measured by the correlation coefficients where positive, negative or near-zero coefficients point to pro-, counter-, and acyclicality, respectively.

Finally, **persistence** indicates the inertia in business cycles, particularly the cyclical component, and captures the length of observed fluctuations. This is measured by the first-order autocorrelation coefficient where a high coefficient implies a very persistent, i.e., long, economic fluctuation. Positive coefficients indicate that high values follow high values or low values follow low ones, whereas negative coefficients indicate reversals from high to low values or the reverse.

Table 1
Augmented Dickey-Fuller Tests for Different λs

Variable	p-value	λ =6.25 t-value	p-value	λ =10 t-value	p-value	λ =100 t-value	p-value
Real GDP	1.0000	-2.962	0.0386*	-2.788	0.0600	-2.276	0.1798
Private Consumption	1.0000	-2.656	0.0819	-2.425	0.1348	-2.049	0.2656
Government Expenditures	1.0000	-3.459	0.0091*	-3.153	0.0229*	-2.106	0.2422
Investments	1.0000	-3.435	0.0098*	-3.229	0.0183*	-2.431	0.1331
Exports	1.0000	-4.631	0.0001*	-4.400	0.0003*	-3.493	0.0082*
Imports	1.0000	-2.640	0.0851	-2.501	0.1152	-2.167	0.2183
M1	1.0000	-4.937	0.0000*	-3.794	0.0030*	-2.631	0.0868
CPI	1.0000	-3.823	0.0027*	-3.585	0.0060*	-2.821	0.0554
Inflation	0.0142*	-4.326	0.0004*	-4.226	0.0006*	-3.926	0.0018*
Terms of Trade	0.5553	-3.313	0.0143*	-3.042	0.0312*	-2.343	0.1583
Employment	0.9554	-5.712	0.0000*	-5.487	0.0000*	-4.896	0.0000*
Real Interest Rate	0.0000	-7.011	0.0000*	-6.878	0.0000*	-6.272	0.0000*

Source: Author's calculations.
All regressions include a constant. The critical value at the 5% significance level is -2.89 from Fuller (1976), indicated by an asterix.

III. BUSINESS CYCLES IN DEVELOPING COUNTRIES: A BRIEF DESCRIPTION

Volatility

Business cycles in industrialized countries are found to cover a period of approximately 8 years with high volatility in investments and low one in consumption. For developing countries, Rand and Tarp (2001) emphasized the comparatively shorter and, on average, more volatile cycles. In a country sample of Sub-Saharan African countries, Latin American countries, and Asian and North African countries for the period 1980-99, business cycles covered periods of 4 to 5 years only. Particularly outstanding erratic cycles are present in Sub-Saharan African countries. Interestingly, output fluctuations in the group of Asian and North African countries show the strongest resemblance with those of industrialized countries. A more pronounced, however over time decreasing, volatility seems to be present for Asian countries as compared to the G7 countries (Kim et al., 2003).

Additionally, in resemblance with the G7 countries, investment is the most volatile and private consumption the least volatile national expenditure component in Asia. With respect to the inflation rate and money

supply, volatility is four times and two times larger, respectively, in Asian economies as compared to industrialized countries.

Co-Movements

For industrial countries, King and Rebelo (1999) stressed that most macroeconomic variables are procyclical with a particularly high degree of co-movement between aggregate output and total hours worked. Additionally, wages, government expenditures, and the capital stock seem to display no systematic cyclicality with aggregate output. A comparative study conducted by Kim et al., (2003) between the G7 countries and a number of APEC member countries reveals significant similarities in the cyclicality of key macroeconomic variables, with however surprising differences in the fiscal policy variable (Agénor et al., 2000). Government expenditures are found to vary strongly procyclically, however over time decreasing, with output with the exception of the Philippines with the degree of procyclicality further increasing over time. In resemblance with the group of G7 countries, money stock (M2) of the studied Asian countries moves in a procyclical manner. Hence, fiscal and monetary policies were not directed at stabilizing the economy during difficult and costly times of recessions.

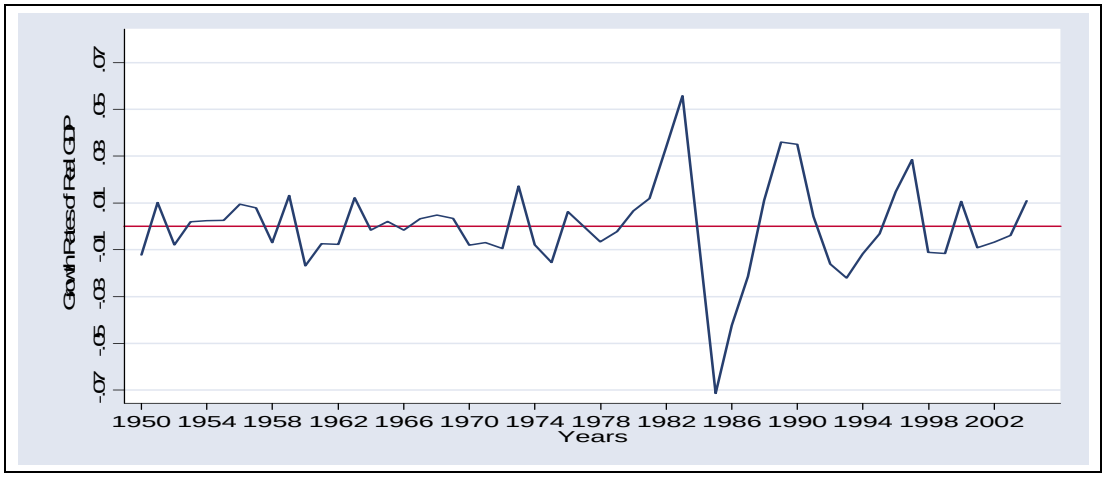
Persistence

Similar patterns emerge for Asian as well as industrialized countries with macroeconomic variables displaying non-negligible persistence (Kim et al., 2003).

IV. EMPIRICAL TEST: THE PHILIPPINE CASE

As Figure 1 suggests, the literature on Philippine development correctly depicts an economy popular for its boom-bust cycles, at least starting in the early 1980s. The Appendix with the representation of business cycles of a number of selected countries presents further evidence of comparatively short and volatile cycles within the range of +/- 2% until 1980.

Figure 1
The Philippine Business Cycles, 1950-2003

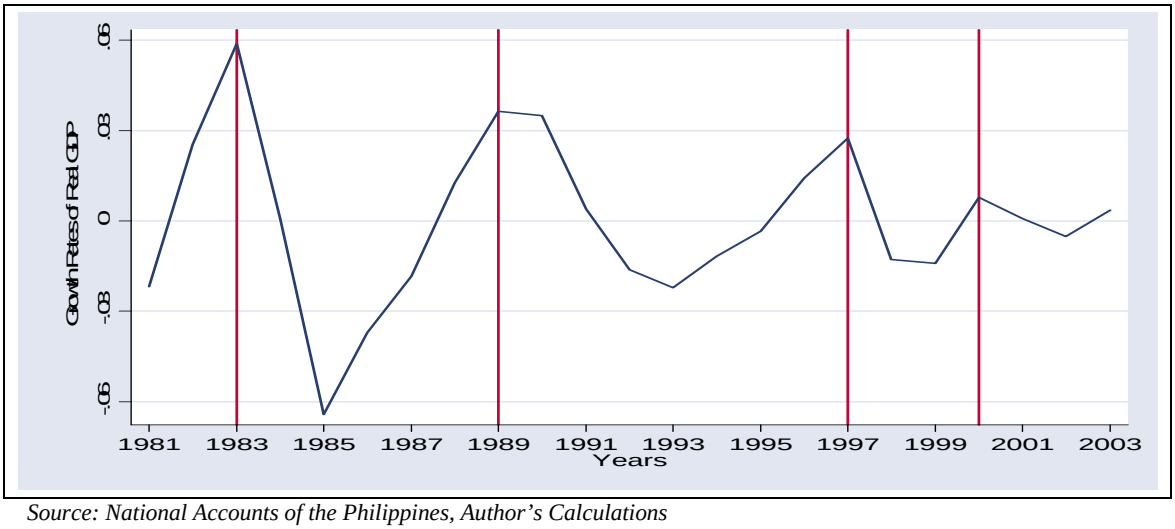


Source: GGCD-Data

Theoretically, these should be complemented by counter-cyclical policies where a boom phase calls for contractionary policies to prevent the economy from overheating, while a bust phase needs expansionary policies to pump-prime the economy.

The particularly strong and erratic cycles starting in the early 1980s motivate a detailed description of the Philippine business cycle, covering the period 1981-2003 as depicted in Figure 2. The data cover gross domestic product, private consumption, government expenditures, investments, exports, imports, money supply (M1), the consumer price index (CPI), the inflation rate and the terms of trade. The HP filter process was done to decompose the output series with λ set equal to 6.25. Interestingly, the observed data comprise three business cycles of different lengths and depths. One cycle covers the period 1983 to 1989 characterized by a deep recession in 1985 followed by an impressive boom in 1989. The other two cycles, one from 1989 to 1997, and the other from 1997 to 2000, are comparatively smoother, hence less destabilizing in nature. Interestingly, the identified business cycles seem to become less erratic over time to potentially peter out and return to their previous range of +- 2% annual real GDP growth.

Figure 2
Business Cycle – 1981-2003



Source: National Accounts of the Philippines, Author's Calculations

Volatility

Table 2 reports standard deviations of HP-filtered national expenditure components, as well as M1, the CPI, the inflation rate, the terms of trade, employment and the real interest rate. Among the national expenditure components, investment is the most volatile variable while private consumption is the least volatile. With the exception of private consumption, all components show higher volatility than GDP, with investments five times more volatile than GDP. An inadequate physical infrastructure and the low level of human resource development might account for highly volatile investments[1]. Among the monetary and price variables, money supply M1 is three times and CPI is two times more volatile than GDP, while the inflation rate is

20 times more volatile than GDP. The high volatility of investments is typically associated with Keynes' famous assertion of "animal spirits" of investors – exogenous and perhaps self-fulfilling waves of optimism and pessimism. This also forms part of the widely accepted belief that investment bursts set off business cycles. After decomposing the whole period under investigation into two independent subperiods, one covering 1981 to 1990 and the other covering 1991 to 2003, it becomes apparent that for the first period, all variables – with the exception of exports – depict higher volatility while for the second period, all variables – with the exception of exports – depict lower volatility than observed for the period as a whole. Additionally, the above result of exceptionally strong but petering off cycles is supported.

Table 2
Standard Deviation

Variable	# of Obs.	Std. Dev.	Std. Dev. (1981-1990)	Std. Dev. (1991-2003)
Real GDP	23	.0265155	.0380838	.013779
Private Consumption	23	.0107442	.0153734	.0058016
Government Expenditures	23	.0350056	.0462383	.0249129
Investments	23	.1205639	.1713617	.0664591
Exports	23	.0639919	.0583565	.070215
Imports	23	.0775841	.0979166	.0612324
M1	23	.0851045	.1117204	.0619379
CPI	23	.0490538	.0748671	.0136973
Inflation	22	.4427948	.6681948	.2128311
Terms of Trade	22	.0508288	.056055	.0484733
Employment	22	.0164105	.0201776	.0133921
Real Interest Rate	18	.3818979	.5072963	.323084

Source: Author's calculations.

Co-movements

Table 3 reports cross-correlations of national expenditure components, M1, CPI, inflation rate, terms of trade, employment and the real interest rate with output. With the exception of prices, the terms of trade, inflation, employment and the real interest rate, all variables have strong and positive correlation with GDP, while only inflation, the terms of trade, employment and the real interest rate appear non-significant at the 5% level. The positive and significant relationship with both government expenditures and M1 implies that government expenditure as a fiscal policy tool, and M1 as a monetary policy tool, turn out to be clearly procyclical. This also means that for the sample period, no active countercyclical stabilization policy was conducted to swiftly overcome economic recessions. This policy stance directly contradicts theoretical prescription of counter cyclical policies during boom-bust periods.

Table 3
Cross-Correlation Matrix

Variable	Real GDP	Real GDP (1981-1990)	Real GDP (1991-2003)
Private Consumption	0.8641*	0.9307*	0.4973
Government Expenditures	0.7879*	0.8521*	0.5807*
Investments	0.9343*	0.9833*	0.6707*
Exports	0.5734*	0.5281	0.9171*
Imports	0.8756*	0.9171*	0.8350*
M1	0.6987*	0.8084*	0.3288
CPI	-0.7100*	-0.7552*	-0.3345
Inflation	0.0190	-0.0260	-0.1188
Terms of Trade	-0.3318	-0.3152	-0.4855
Employment	0.3583	0.4049	0.2355
Real Interest Rate	0.1452	0.2091	0.0651

Source: Author's calculations.
Asterix denotes significant at 5 % level.

Table 4
First Order Autocorrelations

Variable	First-Order Autocorrelation	First-Order Autocorrelation (1981-1990)	First-Order Autocorrelation (1991-2003)
Real GDP	0.4056	0.4174	0.2460
Private Consumption	0.4625	0.4465	0.3607
Government Expenditures	0.2668	0.3166	0.1186
Investments	0.2720	0.3570	0.0819
Exports	-0.0183	-0.1449	0.0466
Imports	0.4701	0.5300	0.4119
M1	-0.0990	0.0162	-0.3714
CPI	0.1629	0.1686	0.2239
Inflation	0.0380	0.0499	-0.2451
Terms of Trade	0.2605	0.2611	0.2676
Employment	-0.2560	-0.3121	-0.1540
Real Interest Rate	-0.4347	-0.4017	-0.2698

Source: Author's calculations.

A closer inspection of the periodical decomposition shows that, with the exception of exports, all variables in the first subperiod reveal stronger correlation with real GDP than the ones observed for the period as a whole, while with the exception of exports and inflation, all variables in the second subperiod are both lower than the ones in the first and the overall period. For the first period, only inflation, terms of trade, employment and the real interest rate are insignificantly correlated with real GDP while for the latter period, only government expenditures, investments and exports reveal positive significant correlation with real GDP.

Persistence

Table 4 shows the persistence of the variables as measured by the first order autocorrelation. The data reveal weak persistence, with GDP, private consumption and imports as the most persistent macroeconomic variables. Hence, the low serial correlations leave hardly any grounds for predicting the course of business cycles. A comparison of the two subperiods additionally points at higher persistence of the first as opposed to the second period variables.

IV. POTENTIAL SOURCES OF THE PHILIPPINE BUSINESS CYCLES

Over the past decade, considerable effort has been put in shedding light on the sources of business cycles by studying the price-output and inflation-output correlations, i.e., the cyclicality of prices and inflation. If supply shocks like terms of trade shocks, technology shocks or shocks due to extreme weather conditions are identified as the basic source, a negative price-output correlation should be observed. Conversely, if demand shocks like shocks to private or public consumption or monetary shocks represent the source of the business cycle, a positive price-output correlation should be identified. In a traditional AS-AD framework, a shift of the supply curve (AS) along the demand curve (AD) leads to countercyclical prices while a shift of the demand curve along the supply curve results in procyclical prices/inflation.

The real business cycle theory, as a purely supply side approach and the traditional Keynesian theory, as a purely demand side approach, lead to different price-output correlations and therefore help discriminate among different economic schools. Traditionally, the Keynesian demand driven models focus on the inflation rate rather than the price level as the variable of interest so that a positive inflation output correlation emerges. In that respect, the real-business-cycle theory leads to countercyclical prices and the traditional Keynesian theory predicts procyclical inflation rates.

Empirical results on developed and developing countries, however, remain inconclusive as to the exact source of cycles. Chadha and Prasad (1994), using quarterly data from the IMF's International Financial Statistics tape point at the countercyclicality of the price level for the G7 countries. However, this result does not carry over to the inflation-output correlation and no clear-cut inference about the source of the shock can be made. Additionally, Kim et al., (2003) in their business cycle analysis for the APEC countries emphasized the countercyclicality of the price level for Indonesia, Korea, the Philippines and Thailand, indicating supply-side driven fluctuations. Interestingly, results for Malaysia and Singapore seemed to suggest demand-driven business cycles. Apergis (1996) reached conclusive results for the price-output and the inflation-output correlations for Korea, India, Mexico and the Philippines, pointing at the significance of supply shocks in fostering business cycles. Agénor et al., (2000) conducted a study on a number of developing countries to shed light on the potential source of observed economic fluctuations and revealed negative price-output and inflation-output correlations for Columbia, Nigeria, Tunisia and Turkey. Again, the results seemed to indicate that supply shocks initiated the observed fluctuations. Put together, although no clear-cut evidence on the exact source of business

cycles can be drawn, it is more than suggested that supply shocks seem to play a significant role, particularly for the Philippines.

The real business cycle approach is predominantly attractive for economists interested in the supply-side driven economics of technological change. In that vein, an external sector neutral technological (supply) shock initiates economic fluctuations. Additionally, Mendoza (1995) emphasized that the term supply shock could have a different connotation for developing countries as it has for large developed countries. In particular, developing countries could be subject to large terms of trade shocks rather than productivity shocks. He showed that about 50 percent of overall output fluctuations for the G7, as well as for developing countries, were due to shocks to terms of trade.

Table 5
Correlation Matrix

	Panel A. Filtered Prices and Output			**Panel B. Inflation and Filtered Output**		
Lag	Whole Period	Subperiod 1981-1990	Subperiod 1991-2003	Whole Period	Subperiod 1981-1990	Subperiod 1991-2003
3	0.3549	0.4093	-0.3118	-0.2422	-0.2038	-0.2064
2	0.0541	0.0805	-0.2058	-0.4769*	-0.5163	-0.2526
1	-0.6638*	-0.7081*	-0.2874	-0.5731*	-0.6974*	-0.3227
0	-0.7100*	-0.7552*	-0.3345	0.0190	-0.0260	-0.1188
-1	0.1982	0.1882	0.3550	0.6342*	0.7329*	0.5315*
-2	0.6430*	0.7160*	0.5492	0.3322	0.4566	0.4574
-3	0.2809	0.3561	0.3205	-0.2049	-0.1961	0.1294

Source: Author's calculations. Asterix denotes significant at 5 % level.

Table 5 reports correlations between contemporary HP-filtered prices with leading and lagging real output in panel A and correlations between contemporary inflation and HP-filtered leading and lagging real output in panel B, all for periods of up to three leads and lags. Again, a periodical decomposition for both correlation analyses was conducted.

For the period as a whole as well as the first subperiod, panel A reports strong and negative correlations between current CPI and GDP. These results support predictions of supply-side led theories of economic fluctuations, like the real business cycle approach. At additional lags or leads, a mixed and inconclusive picture emerges however. The second Subperiod correlations turn out insignificant at any lead or lag.

Panel B reports a weak positive but insignificant correlation between inflation and GDP for the period as a whole, and weak negative insignificant correlations between said variables for the two subperiods. Though insignificant, contemporaneous correlations between inflation and GDP point at a potential role of demand-side led theories for the period as a whole, while the two subperiods are more in line with supply-side led theories of economic fluctuations. At additional leads and lags, an inconclusive picture emerges again.

Contemporaneously, demand-side driven business cycle theories seem to play a rather insignificant role in triggering the Philippine business cycles.

Additional empirical support for supply-led shocks for Asia as a whole, and the

Philippines in particular, is provided by Apergis (1996), Hoffmaister and Roldos (1997), Kim et al., (2003) and Rand and Tarp (2001). Moreover, Reside (2002) suggests the obvious supply-led cycles in the Philippines as predominantly emanating from changes in the weather with sometimes disastrous effects on agricultural output and consequently overall GDP. However, despite the Philippines' alleged comparative advantage in the agricultural sector, a decomposition of the annual real GDP growth rate into its sectoral contributors point at a negligible role of the agricultural sector for the sample period. In fact, the service sector turns out to be the dominant contributor to economic growth.

Additionally, the low and negative correlation between GDP and the terms of trade suggests that terms of trade shocks may not have been an important source behind the observed output fluctuations.

V. FINDINGS AND CONCLUSION

The Philippine economy underwent three business cycles from the period 1981-2003 broken down into the following – 1983-1989, 1989-1997, and 1997-2000. The first cycle appears to be the strongest with output growing, and contracting significantly, within a span of four years. The span of the first two cycles is approximately 7 years while the latter covers only three periods. Thus, it is very likely that the third cycle is still on going. Below is a general description of the cycle's basic characteristics:

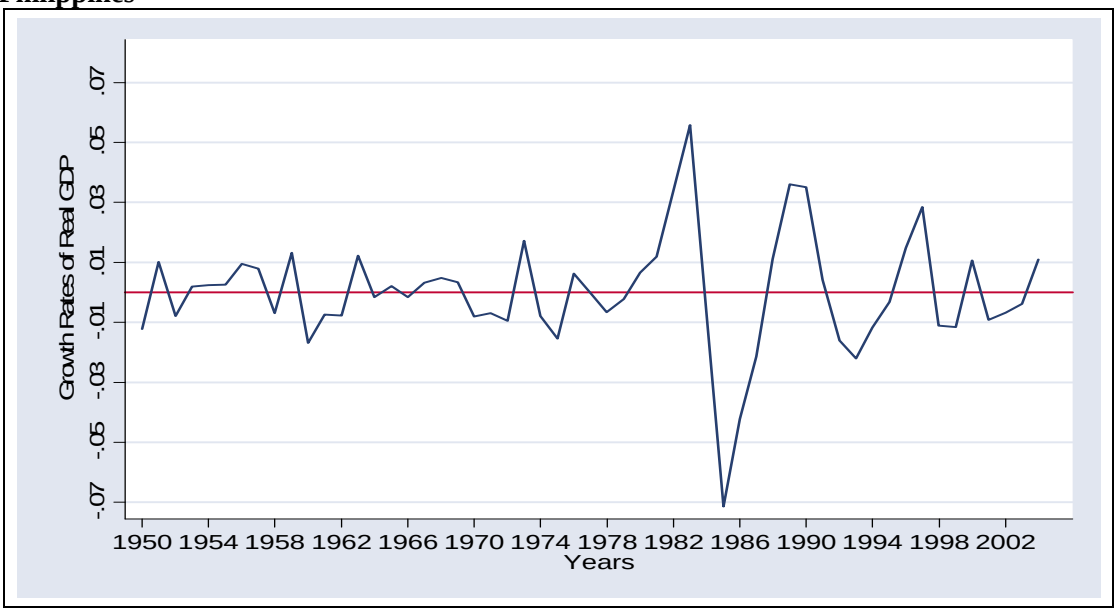
1. Volatility, as a preliminary indication of significance for macroeconomic fluctuations, point to investments as the most volatile while private consumption is the least. This is suggestive of investors' animal spirits affecting fluctuations.
2. The co-movements of GDP and all variables, with the exception of prices, inflation, the terms of trade, employment and the real interest rate, exhibit strong and positive correlation.
3. All key macroeconomic variables reveal fairly low persistence, with GDP, private consumption and imports as the most persistent ones.

The potential sources of economic fluctuations for the entire period point at one culprit—supply-side shocks. This is implied from the strong, negative and significant contemporary correlation of the price and output. Further, the weak, positive and insignificant contemporary relationship of inflation and output supports the finding that fluctuations are more supply-side, than demand-side, in origin. Supply-side shocks can be identified to be technological change, terms of trade shocks, or changes in weather. However, test for terms of trade shocks reveal a weak and negative correlation between trade and output. This leads to the hypothesis that technological change or changes in weather (the El Niño effect) spurred economic fluctuations for the Philippine economy.[2]

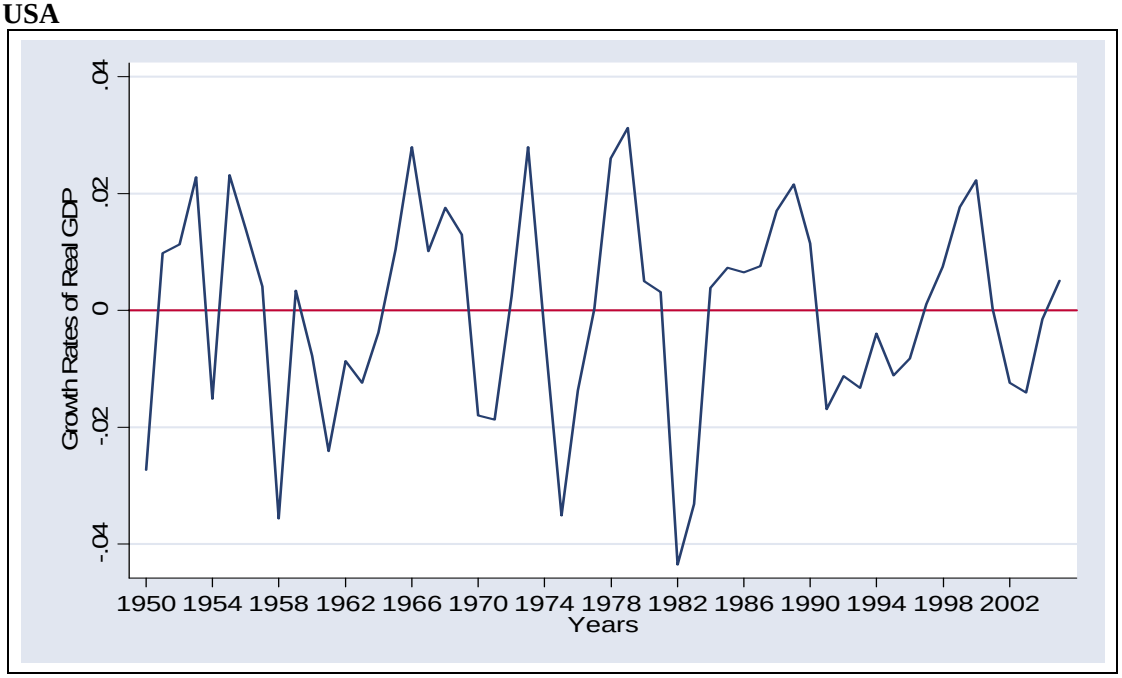
Generally, the boom-bust cycle calls for a counter-cyclical policy approach. The Philippines contradicted this approach and applied a pro-cyclical stabilization policy. This claim is supported by the highly positive and strong correlation of government expenditures and money supply with output. This is tantamount to saying that the government failed in its role to stabilize the economy. Moreover, it lacked an understanding of the nature of the fluctuation, making it inefficient in designing a more appropriate stabilization policy.

APPENDIX
Business Cycles of Selected Countries
(Source: GGCD-Data Series)

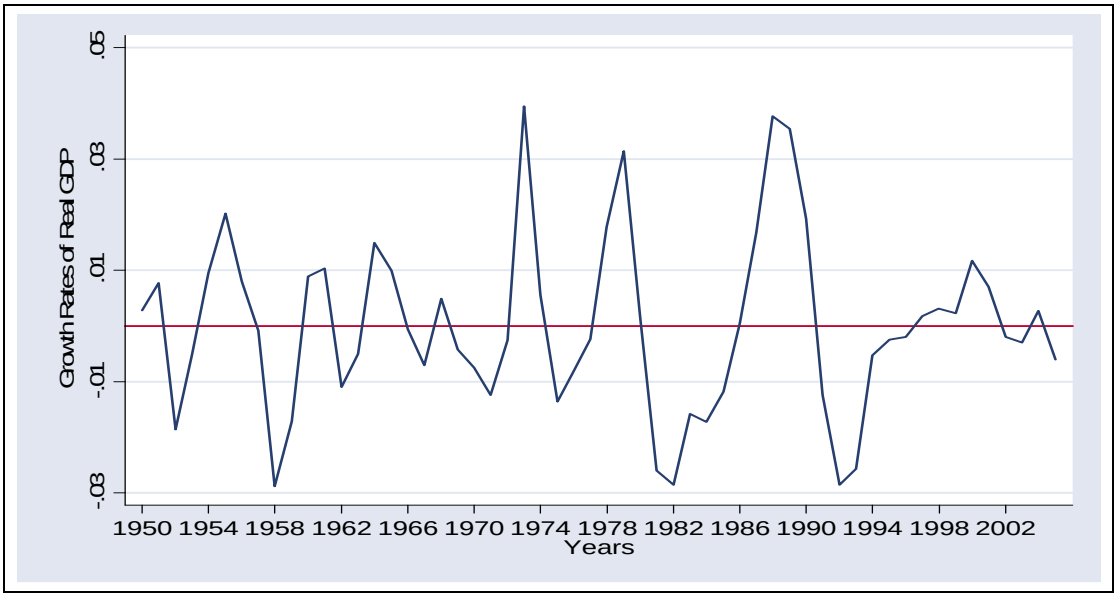
Philippines



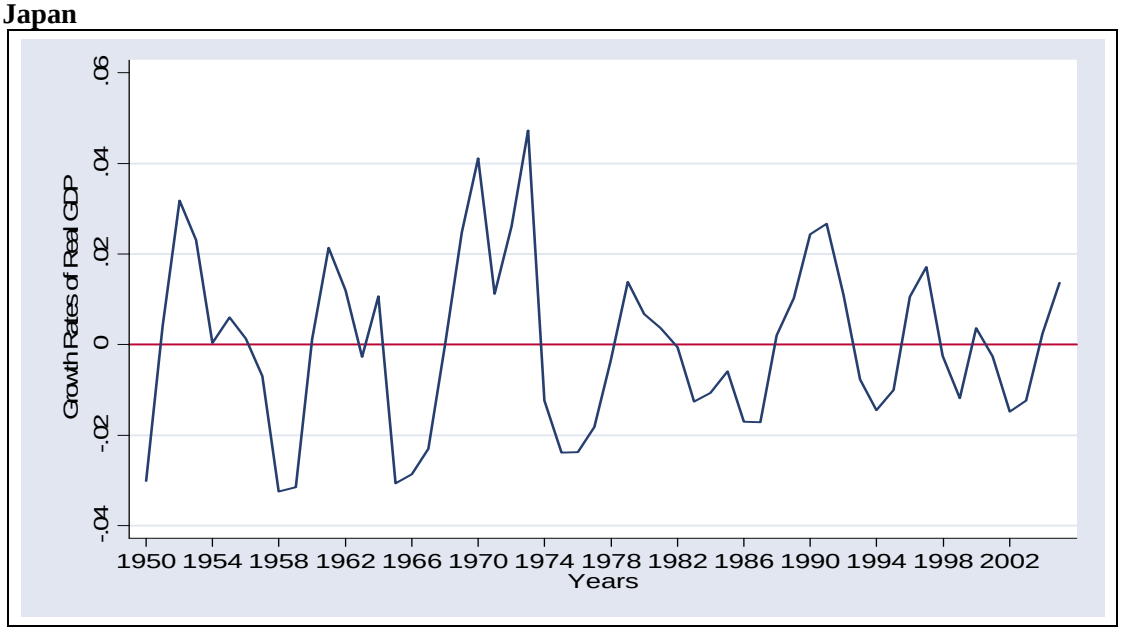
USA



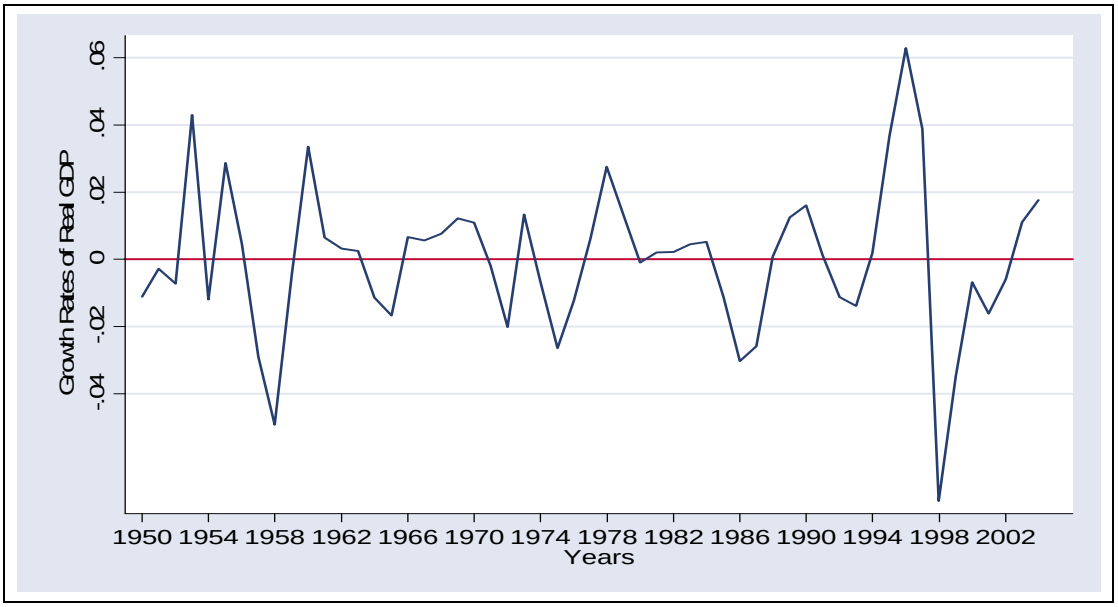
UK


Growth Rates of Real GDP
-.03
-.01
.01
.03
.05
1950 1954 1958 1962 1966 1970 1974 1978 1982 1986 1990 1994 1998 2002
Years

Japan


Growth Rates of Real GDP
-.04
-.02
0
.02
.04
.06
1950 1954 1958 1962 1966 1970 1974 1978 1982 1986 1990 1994 1998 2002
Years

Thailand



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NOTES

[1] A point stressed by Joseph Yap, President of the Philippine Institute for Development Studies.
[2] On-going study.