The Macro Determinants of the Drop in Pakistan's Long Run GDP Growth

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Abstract

This paper attempts to address the long-run determinants of trend GDP growth in Pakistan for years 1973 till 2017. The theoretical framework chosen has been the Keynesian general equilibrium framework of aggregate demand, decomposed into the macro aggregates of consumption, investment, government expenditures, exports and imports (Keynes, 1937). The analytical strategy we have used is to establish first whether there has been a discrete drop in GDP growth at any particular break date. Establishing a break date allows us to define two periods of GDP growth, a higher growth period, followed by a lower growth period. The determinants of GDP growth can then be established, by looking for correlated changes in their behavior between the two time periods. Our findings suggest that high GDP growth in the first phase, pre-1992, is explained by high investment growth. Paired with a Marginal Propensity to Consume in this phase which is low. Making this high GDP growth phase investment led. Low GDP growth in the second phase, post-1992, is now explained by low investment growth. Paired with a Marginal Propensity to Consume, in this phase which is higher. Making this phase consumption-led.

Keywords: GDP; growth; investment; marginal propensity to consume.

JEL Classification: E200

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1. Statement of the problem

Pakistan's growth has lowered on trend in the past three decades. The earlier decades of the 60s, 70s and 80s saw trend GDP growth of over 6% per annum as Figure 1 shows, but from about 1990 onwards trend growth is observed to have lowered significantly to just above 4% per annum.

In addition to the concern of long-run trend growth, Pakistan has been subject to shorter-run shocks, with budgetary deficits creeping up to unsustainable levels, also fueling inflation, and equally unsustainable Current Account (CA) deficits. These imbalances on the budgetary and CA sides have required repeated recourse to the IMF Standby (SBA) and Extended Fund Facility (EFF) loans. Indeed, the frequency of Pakistan's recourse to IMF bailouts, 23 and counting, has pushed the recent debate entirely to an examination of shorter-run cyclicality in GDP, putting on the back burner, the earlier debate about longer run structural determinants of GDP growth.

So, there is a paramount need for an examination of the macro determinants of Pakistan's GDP growth in the longer run, over both the highs and lows, to see what has worked to raise it earlier, and lower it more recently.

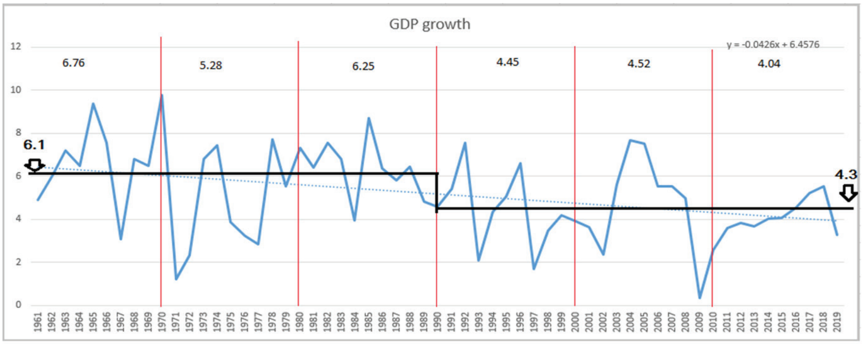

Figure 1: GDP Growth

2. A review of the structural literature on the macro determinants of growth of output

The structural literature takes two distinct approaches to explain the long-run pattern of output growth over time. One approach is based on supply-side growth accounting methodology, a production function approach, which uses the growth of input availability and total factor productivity growth to explain long run output growth. Another approach is based on Keynesian decomposition of demand into macro aggregates.

The production function approach is represented very well by Antolin-Diaz et al. (2017) which tracks the slowdown of GDP growth in the U.S. and other advanced economies. Similarly, Fernald and Li (2019) also explain the slower GDP growth of U.S. Both have identified total factor productivity growth as a major determinant of GDP growth. In the case of Pakistan as well, on the supply side, productivity growth has been identified as the major determinant of growth (Saleem et al., 2019; Siddique, 2020).

The Keynesian approach of decomposing demand into macro aggregates can be summed up by Clementi et al. (2015) and de Freitas and Dweck (2013), who give the most comprehensive set of determinants to explain output growth. Both the papers represent output growth as a function of consumption, investment, government expenditures, exports and imports. The recent literature explains output growth in relation to specific set of macro determinants. A study by Liao et al. (2019) explains the output growth in relation to consumption spending and a study by Connolly and Lai (2016) explains output growth as a function of government spending. The study by Mansoor et al. (2018) explains economic growth in Pakistan in relation to aid volatility. And Alam (2012) provides the empirical analysis of economic growth in Pakistan in relation to exports and imports.

For Pakistan, the review of the structural literature shows large explanatory bias towards the exogenous demand variables and the monetary variables rather than domestic demand variables to explain long run growth (Shahbaz et al., 2008; Khan & Jawed, 2019; Mahmood & Arby, 2012). The decomposition of domestic demand variables, into consumption and investment is consistently missing in the literature except in Choudhary and Pasha (2013) and Choudhary et al. (2017).

The methodology that stands out from the literature as the most comprehensive is by de Freitas and Dweck (2013) and Clementi et al. (2015). We aim to formulate our theoretical framework based on their established methodology.

3. A theoretical framework

So, we begin with the de Freitas and Dweck (2013) and Clementi et al. (2015) standard textbook mother equation in macroeconomics:

$$Y = C + I + G + X - M \tag{1}$$

(i) Assessing the impact of the quantum of the macro aggregates, on output Y.

First, on the right-hand side of the equation, the quantums of private consumption C, private investment I, government expenditure G, exports X, and imports M, will determine on the left-hand side of the equation the quantum of output.

(ii) Examining the relationship between the long run structural determinants themselves: consumption C, and investment I.

But the more complex relationships further lie on the right-hand side of the equation, between the determining variables themselves. It is these interactions between the determining variables, which give the final quantum on the right-hand side, determining on the left-hand side of the equation the quantum of output.

So, the second relationship is between the right-hand side of the equation's determinants of private consumption C and private investment I are the two structural determinants of output. In that the literature considers them to be slow movers over time, relatively less policy amenable in the short run, and therefore determinants of long run output and its growth.

Now investment I determines output growth □Y, as given by the Harrod Domar model (Harrod, 1939; Domar, 1946), through a Capital Output ratio K/Y. So:

$$\Delta Y = I / K/Y \tag{2}$$

But the size of the Capital Output ratio K/Y, is not well explained by the Harrod Domar model (Harrod, 1939; Domar, 1946). It is simply attributed to the amount of capital stock K in the economy. And the capital stock K, in turn is some function of the accumulation of investment over time t:

$$Kt_n = f_n I \sum (It_1 + It_2 + \dots It_{n-1}) \tag{3}$$

So, it is not only the current level of investment, but also the past levels of investment, that determine output growth ΔY. As such the cumulative function of I, fnI, is not well defined, in that we do not know what portion of It is to be cumulated. So, we have insufficient determination of the capital stock Ktn.

Indeed, in the Cambridge Capital controversy, Joan Robinson questioned the notion of the neoclassical construct of capital (Robinson, 1971). In the neoclassical model, the marginal product of capital is used to determine its price, given by the interest rate. But the problem for Joan Robinson was that the construct of capital had to be an accumulation of capital stock, and this accumulation of capital stock had to be through aggregated physical capital. Which in turn had to be priced, to be aggregated, requiring a price of capital, given by the interest rate. So, the dilemma of the neoclassical model is that it requires an interest rate, to aggregate capital, to determine its marginal product, to determine in turn the interest rate.

The bearing of the Cambridge Capital controversy (Robinson, 1971) for us here is that as the interest rate r varies over time t1 to tn, so the capital output ratio K/Y, has to adjust contra to r, to make it equal to output growth ΔY. So, in equation (3):

$$\Delta Y = I / K(r) / Y \tag{4}$$

As the interest rate r goes up for example, capital K will go up, as will the capital output ratio K/Y go up. So, the growth rate of output ΔY will drop. So, the capital output ratio K/Y, will go up and down with the interest rate r. Yet the capital output ratio K/Y is meant to be a much more stable fraction fnI of accumulated investment over time as in equation (3), in which case it cannot be as volatile as the interest rate r.

So, the neoclassical construct of the capital output ratio, as given by the Harrod Domar model (Harrod, 1939; Domar, 1946), is not well defined.

But Lord Kahn and Keynes (Keynes, 1937) neatly step in here to add another macro variable to explain output Y and its growth over time ΔY, which is consumption C. And consumption C is used to estimate a more specific determination of a multiplier k, such that investment I times a multiplier k, gives output Y.

$$Y = I * k \tag{5}$$

The Kahn-Keynes model (Keynes, 1937) uses the marginal propensity of consumption MPC, to determine k, such that:

$$k = 1 / 1 - MPC \tag{6}$$

Which gives the Kahn-Keynesian (Keynes, 1937) alternative to the Harrod Domar model (Harrod, 1939; Domar, 1946) for determining output Y.

$$Y = I * (1 / 1 - MPC) \tag{7}$$

So, investment I determines output Y, but constrained by the share of incremental income that is consumed, which is the MPC

The Kahn-Keynes multiplier model (Keynes, 1937) thereby poses an interesting tradeoff between consumption driven growth and investment driven growth. Where investment I, determines output Y, but constrained by consumption C. So, a higher investment I will lead to a higher output Y. But the higher output Y, will be constrained by the lower consumption C, through a lower multiplier k. So, Consumption C and investment I, are tradeoffs.

In fact, these two long-run structural determinants of output Y, consumption C, and investment I, give two possible growth paths. Growth of output ΔY, can be an investment I led, or consumption C led.

We will focus on explaining the observed drop in Pakistan output growth between two time periods, pre-1990, and post-1990. We will do this by examining the impact on output, of the macro aggregate determinants of output growth. So, we will focus on examining the two relationships defined above by equations (1) to (7).

(i) The first relationship examined will be assessing the impact of the quantum of the macro aggregates, on output Y.

On the right-hand side of Equation (1), the quantum of private consumption C, the private investment I, government expenditure G, exports X, and imports M, will determine on the left-hand side of the equation the quantum of output Y.

Putting Equation (1) in terms of growth of output, ΔY, and its decomposition into growth in its macro aggregates, ΔC, ΔI, ΔG, ΔX, and ΔM

$$\Delta Y/Y = \Delta C/C + \Delta I/I + \Delta G/G + \Delta X/X - \Delta M/M \qquad (8)$$

Now we can examine which growth determinants on the right-hand side of Equation (8) explain the higher output growth pre-1990 and lower output growth post 1990, on the left-hand side.

(ii) Examining the relationship between the long run structural determinants themselves: consumption C, and investment I, and their complex impact on output Y.

So, the second relationship is between the right-hand side of the equation's determinants themselves, of consumption C and investment I, and then their complex and joint determination of output Y.

Equations (2) to (7) develop this complex and joint determination by investment I, and consumption C, of output Y.

Equation (7) actually says that change in output Y on the left-hand side, will be determined jointly through a complex interaction between growth of investment I and growth of consumption C, on the right-hand side.

In sum, in this paper, our central problem is to explain the drop-in output growth in Pakistan, from 6% pa. in the 60s, 70s and 80s, to 4% from the 90s onwards. To explain this drop-in growth of output, equation (8) can be run separately for each of the two time periods. Showing growth in output over the period, on the left-hand side of the equation, as determined by growth in the macro aggregates, on the right-hand side of the equation.

This theoretical framework adopted gives a set of testable hypotheses. But a prior word is needed on data limitations, comparability and consistency over time, and according to data choices.

4. Data

The time series data for the macroeconomic aggregates for Pakistan, 1960-2017, has been obtained from the following sources:

- Pakistan Bureau of Statistics (PBS)
- State Bank of Pakistan (SBP)

It would have been good to be able to analyse the whole time series available from 1960 to 2017. But the data for pre-1971/72 includes two wings of the country, West Pakistan and East Pakistan, whereas the data from 1972/73 onwards includes just what was West Pakistan.

Therefore, for this reason of comparability, we have begun our analysis from 1972/73. Considering the time series up to 2017.

We have used the time series provided by the PBS and made consistent by the SBP, and the Ministry of Finance of the Government of Pakistan (GOP)[1]. This time series also coincides with the series adopted by the International Monetary Fund's World Economic Indicators (IMF WEI).

5. Hypotheses explaining the drop in long-run growth between the two time periods

The central problem of the paper is to analyze and explain the long-run trend of GDP growth, which has been decreasing over time (Figure 1). Therefore, the need is to examine whether there has been a discrete reduction in GDP growth over time and identify the timing when the reduction has occurred. The first hypothesis is aimed at identifying this trend break in GDP growth.

Hypothesis 1: There has been a discrete reduction in GDP growth over the time period 1973-2017.

If there is a significant reduction in GDP growth, the next step will be to identify the timing of the discrete reduction. The discrete reduction in GDP growth at a particular time is called a structural trend break in GDP growth.

[1] We are thankful to Dr. Kalim Hyder at the State Bank of Pakistan for providing us with the consistent time series of the macro aggregates for Pakistan.

Based on our theoretical framework, GDP growth can be explained using Keynesian macro aggregates (Keynes, 1937). The macro aggregates considered in our theoretical framework are consumption growth, investment growth, government expenditure growth, export growth, and import growth. Of these variables, we will test to examine which of these macro aggregates significantly explain the drop in GDP growth. Particularly we would like to test the hypothesis that high investment growth explains high GDP growth in the first phase of growth, and a drop in investment growth explains the drop in GDP growth in the second phase.

Hypothesis 2a: There has been a significant drop in investment growth over the time period 1973-2017.

Hypothesis 2b: Investment growth significantly explains high GDP growth in the first phase and a drop-in investment growth explains the drop in GDP growth in the second phase.

Our Keynesian theoretical framework further drives GDP growth through two channels. One channel is through the quantum of investment. But the impact of investment on GDP growth is also determined through a second channel. The extent of the impact of investment on GDP growth is seen to be determined by the Kahn-Keynes multiplier (Keynes, 1937) based on the MPC. A rise in the MPC raises the multiplier, and so the extent of the impact of investment on GDP growth. So, we now have two major determinants of GDP growth. The quantum of investment determines GDP growth, but not unaided. The MPC determines the extent of the impact of the quantum of investment on GDP growth.

But our theoretical framework argues, that consumption and investment must not be taken as simple complements in an apparent Keynesian identity. Because a rise in MPC, and therefore in the share of consumption, while raising the multiplier, simultaneously lowers the share of savings. And savings are a major determinant of investment, potentially lowering the quantum of investment. Which gives an interesting tradeoff between the two major drivers of growth, consumption, and investment. Making it conceivable that GDP growth could be led episodically, some phases led more by consumption growth, and other phases led more by investment growth.

Hypothesis 3: Growth in output will be better explained episodically, some cycles being more investment-led, others more consumption-led.

Hypothesis 3a: High GDP growth in phase one, will not be equally explained by high investment growth and high consumption growth. If high GDP growth in phase one is explained well by high investment growth, then the Marginal Propensity to Consume, in this phase will be low.

Hypothesis 3b: Low GDP growth in phase two, will then equally not be explained by both low investment growth and low consumption growth. If low GDP growth in phase two is explained by low investment growth, then the Marginal Propensity to Consume, in this phase will be high.

6. Empirical Methodology for Testing Hypotheses

6.1 Empirical Methodology for testing Hypothesis 1

Hypothesis 1: There has been a discrete reduction in GDP growth over the time period 1973-2017.

This requires a methodology that can detect abrupt changes in the data series, called breaks. For this, a structural break analysis is based on linear regressions to detect discrete mean shifts in GDP growth.

Structural break analysis We propose to start our empirical analysis with the structural break analysis, using the procedures proposed by Bai and Perron (1998, 2003), (henceforth BP), Andrews (1993) and Chow (1960), and lastly using a dummy regression. A key feature of BP's (1998, 2003) procedure is that it allows us to test for multiple shifts in average growth at unknown dates. As compared to Andrews (1993) methodology which tests for a single shift at an unknown date and Chow (1960) which tests for an abrupt mean shift at a known date in the data.

All three procedures, BP (1998, 2003), Andrews (1993) and Chow (1960) can be applied using a multiple linear regression model for multiple breaks. For that we consider the structural change model specified by Clementi et al. (2015) based on the established methodology by BP with m breaks (or, equivalently, m+1 growth regimes) as,

$$g_t^Y = \beta_j + u_t, \qquad t = T_{j-1} + 1, \ldots, T_{j,} \quad j = 1, \ldots, m + 1, \tag{9}$$

Where T is the sample size as To = 0 and Tm+1 = T. The model represents annual growth of GDP, g_t^Y , which equals the regime-specific mean growth rate β_j plus a stationary error term u_t. The aim of the analysis is to determine the optimal number and location of the structural breaks, along with estimating the mean shift parameter. But a prior standardized test needs to confirm whether structural change analysis is applicable on the GDP growth model in equation (9), for which we need to run a CUSUM test.

A CUSUM test for a structural break The cumulative sum test (CUSUM test) for parameter stability is used to test for the presence of structural change in the series. In order to perform CUSUM test in our case, the instability of the parameter β_j in equation (9) will be tested against the null posit of having no structural change. A forecast error greater than zero will indicate instability and therefore structural change in the model.

Bai and Peron's (1998) test for identifying multiple breaks at an unknown time Bai and Perron's (1998) method estimates the number and points of breaks in the data. We begin with finding the optimal number of breaks in the series. By default, when implementing BP's (1998) technique, it selects the optimal number of breaks as the one achieving the minimum Bayesian Information Criteria (BIC) score. BP (1998) suggests a method based on the sequential estimates of the breaks. For which SupFt (m) and expFt(m) sequential tests are used to test for no structural break versus multiple number of breaks.

Andrews (1993) test for identifying a single break at an unknown time Unlike BP (1998), Andrews (1993) procedure works to detect a single mean shift at an unknown time. But, BP (1998) performs better than any other method because it accounts for all the possible breakpoints while identifying the significant break.

Chow's test for a single break at a known time We also follow the Chow (1960) procedure to test the significance of a known break date. It tests the null hypothesis that there is no structural break against the alternative that there is a known structural break at a specified time.

Dummy regression to test for a known break date The direction of the break identified in the previous section can be tested using an intercept dummy in our structural change model, equation (1), using the following specification,

$$g_t^Y = \beta + \theta DU_t + u_t, \tag{10}$$

Where, g_t^Y represents real GDP growth and DU_t is the break dummy variable. The break dummy variable takes the following values $DU_t = 1$ if $t > 1992$ and $DU_t = 0$ otherwise. Equation (10) allows us to check whether GDP growth exhibits a downwards or upwards trend at the identified break point.

So these tests will give us a known break point in the GDP growth series, call it tB. Which will allow us to divide our entire series for GDP growth into say two time periods, pre tB and post tB. Since Figure 1 shows a downwards trend, and a conceivable break point, we can presume that our empirically identified break tB, can give us a time period pre tB which has high GDP growth, and a following time period post tB, with lower GDP growth.

The establishing of these two time periods, pre tB with high growth, and post tB with lowered growth, then becomes the foundation for our further investigation into seeking macro aggregates that correlate to the drop in GDP growth between these two time periods.

6.2 Empirical Methodology for testing Hypothesis 2

We now need to provide an empirical methodology to explain the drop in GDP growth using the macro aggregates from our theoretical framework, of consumption, investment, government expenditure, and exports.

Our Hypothesis 2a expects, however, that of the explanatory macro aggregates of consumption, investment, government expenditure, and exports, it is investment growth that will follow the pattern of the drop in GDP growth.

Hypothesis 2a: There has been a significant drop in investment growth over the time period 1973-2017.

To test this hypothesis requires a functional form that uses growth in each explanatory macro aggregate, consumption, investment, government expenditure, exports, and imports, and tests each for breaks, using structural break analysis. Testing whether the break in investment growth coincides with the break in GDP growth.

Our Hypothesis 2b goes on further to specify that of the explanatory macro aggregates, it is investment growth that will explain high GDP growth in the first pre tB period, and a drop in this investment growth will explain the drop in GDP growth post tB.

Hypothesis 2b: Investment growth significantly explains high GDP growth in the first phase and a drop-in investment growth explains the drop in GDP growth in the second phase.

Accordingly, one statistical test we will use will be based on a classical Chow (1960) test to check the shift in the series at a known break date. A second econometric test will be based on a dummy regression analysis, to test for the significance of the year 1992, as a broken dummy in the growth series.

A structural break test at a known break date for all explanatory macro aggregates In order to test our explanatory variables series for the single mean shift at a known break date, we use the model specified for GDP growth given by equation (11) which can now be specified for a known break date:

$$y_{it} = \beta_{ij} + \epsilon_t \qquad where\ \beta_{i1} \neq \beta_{i2} \tag{11}$$

Where y_{it} represents growth in the variable i in time period *t*. β_{ij} is regime-specific mean growth rate of variable *i*. This model allows the coefficient β_{ij} to change after the break. If TB is the break date, the model is

$$y_{it} = \begin{cases} \beta_{i1} + \epsilon_t & if\ t \leq TB \\ \beta_{i2} + \epsilon_t & if\ t > TB \end{cases} \tag{12}$$

Chow's test (1960) for a known break date for all explanatory macro aggregates. The Wald test for the known break date using Chow (1960)'s procedure will be performed, to determine a break in the growth of the explanatory variables

Dummy regression for testing a known break date in investment growth. The dummy regression model will now be used to test for the direction of the break in growth in the explanatory variables, particularly investment. The model is given as;

$$g_t^I = \beta + \theta DU_t + u_t, \tag{13}$$

Where, g_t^I represents real investment growth and DU_t is the break dummy variable. The break dummy variable takes the following values $DU_t = 1$ if t > 1992 and $DU_t = 0$ otherwise. Specification (13) allows us to check whether investment growth exhibits a downwards or upwards trend.

A test of GDP growth as a function of growth in all the explanatory macro aggregates, consumption, investment, government expenditure, exports, and imports Having provided statistical evidence in support of Hypothesis 2a, there has been a significant drop in investment growth, coinciding exactly with a significant drop in GDP growth. We can proceed to test our Hhesis 2b, which further specifies that GDP growth is explained well by investment growth.

We test this hypothesis using equation (8) from our theoretical framework above.

$$\Delta Y/Y = \Delta C/C + \Delta I/I + \Delta G/G + \Delta X/X - \Delta M/M \tag{8}$$

Where GDP growth, on the left-hand side, is explained on the right-hand side by investment growth, consumption growth, government expenditure growth, export growth and import growth. We expect higher investment growth to explain higher GDP growth in the first phase, pre tB. And a statistically significant drop in investment growth explaining the drop in GDP growth in the second phase, post tB.

Denoting equation (8) for brevity as GDP growth g_t^Y , as a function of growth in macro aggregates. The macro aggregates are consumption growth g_t^C, investment growth g_t^I , government growth g_t^G , export growth g_t^X, and import growth g_t^M.

$$g_t^Y = f(g_t^C, g_t^I, g_t^G, g_t^X, g_t^M)$$

The functional form will be estimated using the double log form as following;

$$logy_t = \alpha_0 + \alpha_1 logrealC_t + \alpha_2 logrealI_t + \alpha_3 logrealG_t + \alpha_4 logrealX_t + \alpha_5 logrealM_t + \epsilon_t \quad (14)$$

where, $logy_t$ represents log of real GDP, $logrealC_t$ represents log of real consumption, $logrealI_t$ represents log of real investment, $logrealG_t$ represents log of real government, $logrealX_t$ represents log of real export, and $logrealM_t$ represents log of real import. The double log form coefficients for equation (14) represents the same effect as if the equation was run as a growth equation.

We can run this equation independently for pre tB and post tB. The coefficients of the model are then tested for equality across the two time periods, pre tB and post tB.

Since our aim in this section is to explain the drop in GDP growth. And, since the break in investment growth coincided with the break in GDP growth. We would want our investment growth variable to siginficantly explain the drop in GDP growth variable, as stated in our Hypothesis 2b. Therefore, while estimating equation (14) we would expect the following propositions to hold:

a. The investment growth coefficient α_2, should be positive and significant for both the phases, pre tB and post tB.
b. The investment growth coefficient α_2, should have a higher value pre tB as compared to post tB.
c. The investment growth coefficient α_2, should significantly differ between the two phases.

6.3 Empirical Methodology for testing Hypothesis 3

Now recalling, our theoretical framework takes the economic argument for determination of GDP growth beyond just investment growth. It pairs investment growth with the share of consumption, specifically the Marginal Propensity to Consume (MPC).

This pairing is added by Hypothesis 3, and further nuanced. Because the hypothesis expects that long run GDP growth is better explained through the quantum of investment growth, paired with the marginal propensity to consume. Further, this Keynesian multiplier can be expected to work inversely with the quantum of GDP growth. The marginal propensity to consume being relatively lower when the quantum of investment growth is high, and the marginal propensity to consume being relatively higher when the quantum of investment growth drops. Therefore Hypothesis 3 expects that high GDP growth in the first phase, will be explained by high investment growth, paired with relatively lower marginal propensity to consume on average. While the drop in GDP growth in the second phase, will be explained by a drop in the quantum of investment growth, paired with a relatively higher marginal propensity to consume on average.

Estimating the Marginal Propensity to Consume The regression can be run independently for two time periods, pre tB and post tB. The coefficient of real GDP in each regression gives us the average value for the MPC for each time period, pre tB and post tB. The specification is given as:

$$realC_t = \alpha_{i0} + \gamma_{i1} realGDP_t + \epsilon_{it} \tag{15}$$

Where i represents two time periods, pre tB and post tB, *realC* represents real consumption and *realGDP* represents real GDP. Since, we will estimate the equation for two time periods, pre tB and post tB, we will have two estimated values for the MPC, represented as, γ_(pretB,1) and γ_(posttB,1). Where pre tB is considered as the high growth phase and post tB is considered as the low growth phase.

Accordingly, to support our hypotheses 3a and 3b, we expect the following propositions to hold true.

a. The estimated MPC value for the pre tB, high growth phase, should be lower than the estimated MPC value for the post tB, low growth phase. That is γ_(pretB,1)< γ_(posttB,1).
b. In addition to proposition (a), the estimated MPC value pre tB should be significantly different from the estimated MPC value post tB. That is γ_(pretB,1)≠ γ_(posttb,1)

7. Empirical Results

7.1 There has been a discrete reduction in GDP growth over the time period 1973-2017.

We begin with our main variable, real GDP growth, observed over the years 1973 to 2017. We seek to provide econometric and statistical evidence for our first hypothesis in this section.

Hypothesis 1: There has been a discrete reduction in GDP growth over the time period 1973-2017.

Table 1

Structural break In Real GDP Growth Series 1973-2017

Result Using R 'strucchange' Package			
Unknown Break Date	Tests Statistics and Probability		
	Test	Statistics	P-Value
Year 1992	$supF_t(1)$	12.84***	0.0073
Year 1992	$expF_t(1)$	3.67***	0.0056
	CUSUM	1.57***	0.0104
	BIC selection	One Break selected: **Year 1992**	Intercept Change: 1974-1992: 5.89% 1993-2017: 4.04%
	Recursive F statistics	Maximum at Year 1992	

Results Using Stata				
Unknown Break date	Break at Year 1992±1	Test Statistics and Probability		
		Test	Statistics	P-Value
Year 1993		swald	12.84***	0.0069
	Year 1992	LR	8.97***	0.0028

The CUSUM test for a structural break Table 1 shows the result for the CUSUM test for our GDP growth model represented by equation (1). The test statistic takes the value 1.57 and is therefore highly significant. This rejects the null posit of having parameter stability and indicates a structural change in the data. It indicates that the decline in long run trend of GDP growth has not been gradual and that in fact there has been a discrete drop in the GDP growth series at some point in time.

Therefore, the CUSUM test identifies the existence of structural change for us but does not identify the particular point in time when the change might have taken place. Hence, our next set of analyses apply three different procedures, based on Bai and Perron (1998), Andrews (1993) and Chow (1960), which identify the location and number of optimal break points.

Bai and Perron's (1998) test for identifying multiple breaks at an unknown time

Bai and Perron's (1998) method estimate the number and points of breaks in the data series.

We begin with finding the optimal number of breaks in the series. By default, when implementing BP's (1998, 2003) technique, it selects the optimal number of breaks as the one achieving the minimum Bayesian Information Criteria (BIC) score.

The result in Figure 2, plots the BIC scores and the residual sum of squares (RSS). The BIC score is minimum at one break with a score of 184.39. Therefore, the program itself chooses one break point, the break date as year 1992, and exhibits a significant drop in the average GDP growth rate from 5.89 percent to 4.04 percent.

Figure 2: BIC and Residual Sum of Squares

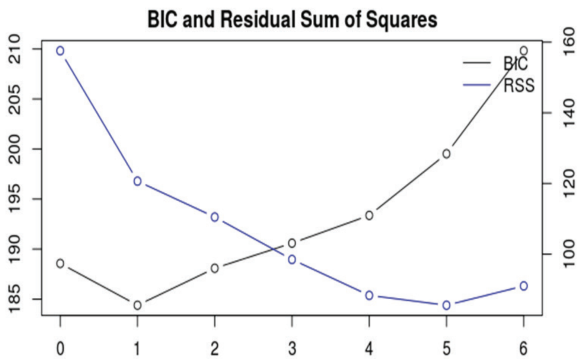

Figure 2: BIC and Residual Sum of Squares

The sequential test statistics, supFt (m) and expFt(m) values are reported in the table. Here, the supFt (m) for m=1, where m is the number of breaks, takes the value 12.84 and is therefore highly significant for the presence of one break in the series. Similarly, expFt(m) takes the value 3.67 and is significant. Both the forms of sequential tests are highly significant and choose one significant breakpoint in the data, after accounting for the possibility of multiple breakpoints. For better understanding, the sequential F-statistics can be plotted for each year.

Figure 3 shows the sequential F-statistics plot. The maximum value of the F-statistic of 12.84 is indicated by the peak in the plot. The value lies significantly above the critical region and identifies the year 1992, as the most significant break date in the series. Again, the sequential tests result favors our first hypothesis of observing a discrete change in GDP growth.

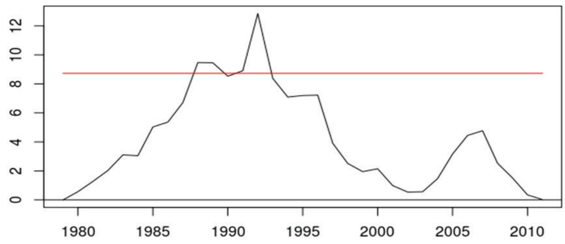

Figure 3: Recursive F-statistics

Therefore, the series of tests under BP's (1998, 2003) technique, all identify a single most significant regime-specific mean shift in GDP growth in the year 1992. And they show that average GDP growth dropped from 5.89 percent between 1973 and 1992 to 4.04 percent post 1992. BP's (1998, 2003) technique strongly supports our hypothesis of having a discrete drop in GDP growth. Accordingly, Figure 4 illustrates our hypothesis, showing the discrete drop in average GDP growth in year 1992, showing that average GDP growth drops from a higher value of 5.89 percent in the period 1973 to 1992, to a lower value of 4.04 percent post 1992. The discrete drop is well within the 95 percent confidence as shown by the interval line around the break date.

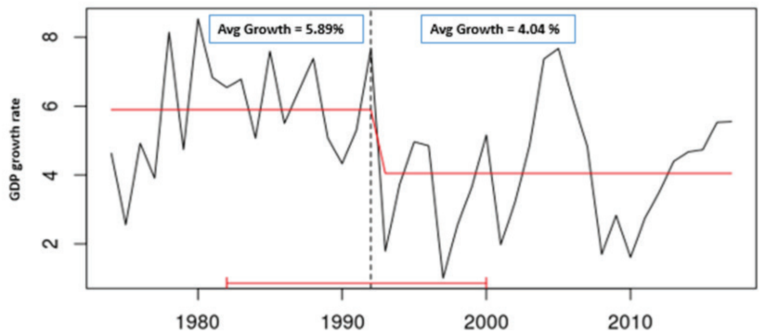

Figure 4: A Structural Break in GDP growth

Andrews (1993) test for identifying a single break at an unknown time Unlike Bai and Perron (1998), Andrews' (1993) procedure works to detect a single mean shift at an unknown time. We now validate our single break date result from the previous section using Andrews' (1993) procedure.

Andrews (1993) suggested using supremum tests based on maximum sample tests to detect a single break date. Stata identifies the year 1993 as a break date. Corresponding to the break date, the sup-Wald test statistic reported in Table 1 has a value 12.84 and is highly significant. The results using the supremum test to detect a single break date further supports our hypothesis of a discrete change in average GDP growth.

Having performed these tests to determine an unknown break date in GDP growth, we now proceed to testing for the identified known break date in 1992.

Chow's test for a single break at a known point in timeWe follow the Chow's (1960) procedure to test the significance of a known break date. We specify the break date as year 1992 and run the LR test. The reported LR test in Table 1 has a value of 8.97 and is highly significant. Therefore, the Chow (1960) type test confirms the year 1992 as a significant structural break in the GDP growth series. The results further add to support our first hypothesis of observing a discrete drop in GDP growth.

Dummy regression to test for a known break dateThe direction of the break identified in the previous section can be tested using an intercept dummy in our structural change model, equation (1), using the following specification,

$$g_t^Y = \beta + \theta DU_t + u_t, \tag{10}$$

Where, g_t^Y represents real GDP growth and DU_t is the break dummy variable. The break dummy variable takes the following values $DU_t = 1$ if $t > 1992$ and $DU_t = 0$ otherwise. Specification (2) allows us to check whether GDP growth exhibits a downwards or upwards trend.

Table 2 reports the results for specification (10). The dependent variable is GDP growth, and the explanatory variable is the break dummy for the year 1992. The coefficient of the break dummy variable,θ takes the value -1.84 and is highly significant. The coefficient shows that after 1992, on average the GDP growth drops by 1.84 percent.

Table 2
Dummy regression for testing a known break date

Variables	**(1)** **Dependent Variable** **GDP growth**	**(2)** **Dependent Variable** **GDP growth**
Dummy1992	-1.849***	-1.524**
	(0.516)	(0.572)
GDP growth$_{t-1}$		0.238
		(0.148)
Observations	44	43
R-squared	0.234	0.291

a. Robust errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

b. Dummy variable *Dummy 1992* =1, for t >1992, DU_t =0 otherwise. GDP growtht-1 is one time period lag of Real GDP growth

The extensive application of these procedures, Bai and Perron (1998), Andrews (1993), Chow (1960) and the dummy regression analysis, consistently choose the year 1992 as a break date in GDP growth. And they show that after 1992, GDP growth dropped significantly by 1.84 percent. Therefore, our first set of results in this section significantly support our first hypothesis, and we can conclude that there has been a discrete drop in GDP growth in the year 1992. That pre-1992 can be considered as a high GDP growth phase and post 1992 can be considered as low GDP growth phase.

7.2 The discrete reduction in GDP growth can be better explained by the macro aggregate of investment

Having established in the previous section that there has indeed been a statistically significant drop in Pakistan's GDP growth from 1992, we now seek to explain the drop in GDP growth using the macro aggregates from our theoretical framework, of consumption, investment, government expenditure and exports. The series for the macro aggregates will therefore also be observed over the time period 1973-2017, as our GDP growth series.

Our Hypothesis 2a expects, however, that of the explanatory macro aggregates of consumption, investment, government expenditure, and exports, it is investment growth that will follow the pattern of the drop in GDP growth.

Hypothesis 2a: There has been a significant drop in investment growth over the time period 1973-2017.

To test this hypothesis requires a functional form that uses growth of each explanatory macro aggregate, and tests each for breaks, using structural break analysis. That is indeed our aim in this section, to test whether the break in investment growth coincides with the break in GDP growth.

Our Hypothesis 2b goes on further to specify that of the explanatory macro aggregates, it is investment growth that will explain high GDP growth in the first pre-1992 period, and a drop in this investment growth will explain the drop in GDP growth post 1992.

Hypothesis 2b: Investment growth significantly explains high GDP growth in the first phase and a drop-in investment growth explains the drop in GDP growth in the second phase.

To test this hypothesis now requires a distinctly separate functional form. This is based on equation (8) above from our theoretical framework.

$$\Delta Y/Y = \Delta C/C + \Delta I/I + \Delta G/G + \Delta X/X - \Delta M/M \quad (8)$$

So, GDP growth, on the left-hand side, is explained by the right-hand side variables of investment growth, consumption growth, government expenditure growth, export growth and import growth. And based on our Hypothesis 2b, we expect higher investment growth to explain higher GDP growth in the first phase. And a statistically significant drop in investment growth explaining the drop in GDP growth in the second phase. And that this investment growth variable explains both phases of GDP growth, better than growth in the other macro aggregate variables posited by our theoretical framework, of consumption, government expenditure, and exports.

7.2.1 A test for a structural break in the growth of all the explanatory macro aggregates, consumption, investment, government expenditure, exports and imports

Our aim in this section is to examine whether the structural break in our key explanatory growth variables, investment growth, consumption growth, government expenditure growth and export growth, coincides with the break in GDP growth. Based on our hypothesis 2a, we particularly expect a possible break date in investment growth to coincide with the break date in GDP growth. 1992 has been identified as the significant break date for the drop in GDP growth. Therefore, in this section we will test our explanatory growth variables for the single most significant mean shift at a known break date, for the year 1992, or fairly approximate to it.

Recalling from our methodology section above, one statistical test we will use, will be based on a classical Chow (1960) test to check the shift in the macro aggregates growth series at a known break date. A second econometric test will be based on a dummy regression analysis, to test for the significance of the year 1992, as a break dummy in the macro aggregate growth series.

A structural break test at a known break date for all explanatory macro aggregates In order to test our explanatory variables growth series for a single mean shift at a known break date, we use the model specified for GDP growth given by equation (11) above, which was for an unknown break date. This equation (11) can now be specified for a known break date:

$$y_{it} = \beta_{ij} + \epsilon_t \qquad where\ \beta_{i1} \neq \beta_{i2} \tag{11}$$

Where y_{it} represents growth in variable i in time period t. β_{ij} is the regime specific mean growth rate of variable i. This model allows the coefficient β_{ij} to change after the break. If TB is the break date, the model is

$$y_{it} = \begin{cases} \beta_{i1} + \epsilon_t & if\ t \leq TB \\ \beta_{i2} + \epsilon_t & if\ t > TB \end{cases} \tag{12}$$

Chow's (1960) test for a known break date for all explanatory macro aggregates The Wald test for the known break date using Chow's (1960)'s procedure will be performed, to determine a break in growth of the explanatory variables. The explanatory variables are investment growth, consumption growth, government expenditure growth and export growth. Table 3 reports the findings for the Wald test at a known break date. Of all the explanatory variables, only the investment variable rejects the null posit of having no structural break. The Wald statistics takes the value 2.64 and is significant at a 10 percent level. Which shows that investment growth has a significant break in the year 1993. Overall, we can conclude that under Chow (1960) testing procedure, the investment growth series showed a significant structural break in the year 1993.

Table 3

A break in the growth of our explanatory macro aggregates

Variable Description	Break at the year1992 ± 1	Tests and Probability		
		Test	Statistics	P-Value
Real GDP Growth	**1992**	$\chi^2(1)$	**8.97****	**0.0028**
Real Consumption Growth	1992	$\chi^2(1)$	0.29	0.5829
Real Investment Growth	**1993**	$\chi^2(1)$	**2.64***	**0.0906**
Real Investment growth²	**1993**	$\chi^2(1)$	**3.19***	**0.0621**
Real Government Growth	1992	$\chi^2(1)$	1.64	0.2001
Real Export Growth	1992	$\chi^2(1)$	1.06	0.3024
Real Import Growth	1992	$\chi^2(1)$	0.0027	0.9584

Real Investment Growth²=Real Investment Growth-Inventories

The above exercise provides valid statistical analysis in support of our hypothesis 2a, that there has been a significant break in the investment growth series. And that the break in the investment growth series coincides with the break in GDP growth.

Dummy regression for testing a known break date in investment growth The dummy regression model to test for the intercept break is specified for the investment growth variable. We repeat the same exercise performed for GDP growth now for the investment growth variable. The model is given as;

$$g_t^I = \beta + \theta DU_t + u_t, \tag{13}$$

Where, g_t^I represents real investment growth and DU_t is the break dummy variable. The break dummy variable takes the following values $DU_t = 1$ if t > 1992 and $DU_t = 0$ otherwise. Specification (12) allows us to check whether investment growth exhibits a downwards or upwards trend.

Table 4 reports the results for specification (13). The dependent variable is investment growth, and the explanatory variable is the break dummy for the year 1992. For the investment growth regression, the coefficient of the break dummy variable,θ takes the value -3.11 percent and is significant. The coefficient shows that after 1992, on average investment growth drops by 3.11 percent. So, the dummy regression significantly supports our hypothesis 2b and we can conclude that there has been a significant drop in investment growth after the year 1992.

Table 4

Dummy regression for testing a known break date in investment growth

Variables	**(3)** **Real investment growth**	**(4)** **Real investment growth^2**
Dummy 92	-3.11* (1.80)	-3.46* (1.94)
Observations	44	44
R-squared	0.059	0.071

a. Robust Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

b. Dummy variable Dummy92=1 for T>1992, DUt =0, otherwise.

Summarizing, the break in investment growth coincides with the break in GDP growth. Our findings show that on average we observe GDP growth to drop by 1.84 percent after the year 1992. Interestingly, we observe a similar trend for investment growth, with investment growth dropping on average by 3.11 percent after the year 1992. Hence, we can say that that the better explanatory variable, coinciding with the downward trend in GDP growth is investment growth, since, both the series, GDP growth and investment growth have a significant drop post 1992.

We can now estimate the correlation between the two series across the two phases, pre-1992 and post 1992, where we expect higher investment growth to explain higher GDP growth in the first phase, pre-1992. And a statistically significant drop in investment growth explaining the drop in GDP growth in the second phase, post 1992. This is a test of our Hypothesis 2b.

7.2.2 *A test of GDP growth as a function of growth in all the explanatory macro aggregates, consumption, investment, government expenditure, exports and imports*

Having provided statistical evidence in support of Hypothesis 2a, that there has been a significant drop in investment growth, coinciding exactly with a significant drop in GDP growth. We proceed to test our Hypothesis 2b, which further specifies that GDP growth is explained well by investment growth.

We test this hypothesis using equation (8)

$$\Delta Y/Y = \Delta C/C + \Delta I/I + \Delta G/G + \Delta X/X - \Delta M/M \tag{8}$$

Where GDP growth, on the left-hand side, is explained on the right-hand side by investment growth, consumption growth, government expenditure growth, export growth and import growth. We expect higher investment growth to explain higher GDP growth in the first phase, pre-1992, and a statistically significant drop in investment growth explaining the drop in GDP growth in the second phase, post 1992.

Recalling from our methodology section above, denoting equation (8) for brevity as GDP growth g_t^Y , as a function of growth in macro aggregates. The macro aggregates are consumption growth g_t^C, investment growth g_t^I , government growth g_t^G , export growth g_t^X, and import growth g_t^M.

$$g_t^Y = f(g_t^C, g_t^I, g_t^G, g_t^X, g_t^M)$$

The functional form will be estimated using the double log form as following;

$$logy_t = \alpha_0 + \alpha_1 logrealC_t + \alpha_2 logrealI_t + \alpha_3 logrealG_t + \alpha_4 logrealX_t + \alpha_5 logrealM_t + \epsilon_t \tag{14}$$

where, $logy_t$ represents *log* of real GDP, $logrealC_t$ represents log of real consumption, $logrealI_t$ represents log of real investment, $logrealG_t$ represents log of real government, $logrealX_t$ represents log of real export, and $logrealM_t$ represents log of real imports. The double log form coefficients for equation (14) make the equation a growth equation. We run this equation independently for pre 1992 and post 1992. The coefficients of the model are then tested for equality across the two time periods, pre 1992 and post 1992.

Since our aim in this section is to explain the observed drop in GDP growth, and, since the break in investment growth coincided with the break in GDP growth, we would want our investment growth variable to siginficantly explain the drop in GDP growth variable, as stated in our Hypothesis 2b. Therefore, while estimating equation (14) we would expect the following propositions to hold:

a. The investment growth coefficient α_2, should be positive and significant for both the phases, pre 1992 and post 1992.
b. The investment growth coefficient α_2, should have a higher value pre 1992 as compared to post 1992.
c. The investment growth coefficient α_2, should significantly differ between the two phases, pre 1992 and piost 1992.

The results for running equation (14) for the two phases, pre 1992 and post 1992, are reported in Table 5.

Table 5
Empirical Estimation for Growth

Variables	(1) Dependent Variable Log (real GDP) Pre 1992	(2) Dependent Variable log (real GDP) Post 1992	Difference
log(consumption)	0.778***	0.755***	0.023
	(0.0159)	(0.00692)	
log(investment)	0.239***	0.171***	0.068***
	(0.0166)	(0.00919)	
log(government)	0.0855***	0.117***	-0.025
	(0.0101)	(0.00473)	
log(exports)	0.130***	0.137***	-0.007
	(0.00248)	(0.00572)	
log(imports)	-0.230***	-0.165***	-0.07***
	(0.0106)	(0.00899)	
Observations	20	25	
D-watson	2.44	2.41	
KPSS on residuals	0.396	0.171	
KPSS 5% critical value	0.463	0.463	
R-squared	1.000	1.000	

a. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
b. The coefficients of the model are consistent in the case of Fully modified OLS (FMOLS) and Dynamic OLS (DOLS).
c. D-Watson value provides no evidence of autocorrelation.
d. All the variables in the model are integrated to order one, hence the variables are cointegrated and the OLS regression yields consistent results.
e. Johanson multivariate cointegration shows we cannot reject the hypothesis of a cointegrating rank at 5% confidence interval

The left hand side variable in Table 5 is the natural log of real GDP. And the right hand side variables are the log of real consumption, the log of real investment, the log of real government expenditure, the log of real exports and the log of real imports. The coefficients are interpreted as the growth coefficients in this functional form. For the consumption growth variable logrealc, a 1 percent increase in consumption growth gives a 0.77 percent change in GDP growth pre 1992 and a 0.75 percent change in GDP growth post 1992. Although the two coefficients are significant in each phase, but the change between the two coefficients does not differ significantly between the two phases. For the government expenditure growth variable logrealg, a 1 pecent increase in government expenditure growth gives a .08 percent growth in GDP pre 1992 and a 0.11 percent growth post 1992. The increase in the coefficient value does not differ significantly between the two phases. Similarly, the coefficients for the other variables, export growth and import growth do not significantly differ between the two phases, pre 1992 and post 1992, and so are not able to provide an explanation for the drop in GDP growth. Finally testing the investment growth variable logreali for the three propositions a,b and c. The investment growth variable, logreali coefficient shows that a 1 percent increase in investment growth gives a 0.24 percent increase in GDP growth pre 1992. The coefficient of investment growth drops post 1992 and is associated with 0.17 percent increase in GDP growth. Both the coefficients are significant and positive in both the phases. The investment growth coefficient has a higher value in the first phase pre 1992, and a lower value in the second phase post 1992. And the drop in the investment growth coefficient is highly significant between the two phases, pre 1992 and post 1992. Thus all the propositions for investment growth hold true for Hypothesis 2b. That:

Investment growth significantly explains high GDP growth in the first phase pre-1992, and a drop-in investment growth explains the drop in GDP growth in the second phase, post 1992.

7.3 The trajectory of GDP growth is even better explained episodically, with a high growth phase led by the quantum of investment, and a low growth phase led by consumption.

In our previous sections we posited an explanation for our central problem that there has been a drop in long run GDP growth. Specifically, analyzing GDP growth on its own, we were able to statistically and econometrically determine a structural break in GDP growth in the year 1992. We showed that GDP growth significantly dropped by 1.8 percent post 1992. That enabled us to examine GDP growth under two phases, a high growth phase pre-1992 and a low growth phase post 1992. Following that, our next section identified investment growth, as the most significant explanatory variable to explain the drop in GDP growth post 1992. As the break in the investment growth variable coincided with the break in GDP growth. Also, the investment growth variable significantly dropped post 1992. But the clinching econometric evidence has come from the finding that high investment growth significantly determines the high GDP growth in the first phase, pre-1992. And that low investment growth significantly determines the low GDP growth in the second phase, post 1992.

Now recalling, our theoretical framework takes the economic argument for determination of GDP growth further, going beyond just investment growth, it pairs investment growth with the share of consumption, specifically the Marginal Propensity to Consume (MPC).

This pairing is added by Hypothesis 3, and further nuanced, because the hypothesis expects that long run GDP growth is better explained through the quantum of investment growth, paired with the marginal propensity to consume. Further, this Keynesian multiplier can be expected to work inversely with the quantum of GDP growth, with the marginal propensity to consume being relatively lower when the quantum of investment growth is high, and the marginal propensity to consume being relatively higher when the quantum of investment growth drops. Therefore hypothesis 3 expects that high GDP growth in the first phase, will be explained by high investment growth, paired with a relatively lower marginal propensity to consume on average. While the drop in GDP growth in the second phase, will be explained by a drop in the quantum of investment growth, paired with a relatively higher marginal propensity to consume on average.

Now the relationship between GDP growth and investment growth has already been well established above, as a strongly significant positive relationship. So it is the inverse relationship between investment growth and the MPC that needs to be established. Ultimately giving, for the high GDP growth phase pre-1992, which is investment led, to have a significantly lower value of MPC. And in the lower growth GDP phase post 1992, with an investment drop, to have a higher value of MPC.

Using the Marginal Propensity to Consume to explain the determination of GDP Estimating the Marginal Propensity to Consume Recalling from our methodology section above, the MPC is estimated by running the regression of real consumption as a function of real GDP (Keynes, 1937). The regression will be run independently for the two time periods, pre-1992 and post 1992. The coefficient of real GDP in each regression gives us the average value for the MPC for each time period, pre-1992 and post 1992. The specification is given as:

$$realC_t = \alpha_{i0} + \gamma_{i1} realGDP_t + \epsilon_{it} \tag{15}$$

Where i represents two time periods, pre-1992 and post 1992, *real C* represents real consumption and *rea lGDP* represents real GDP. Since, we estimate the equation for two time periods, pre-1992 and post 1992, we will have two estimated values for the MPC, represented as, $\gamma_{pre1992,1}$ and $\gamma_{post1992,1}$. Based on the results in section 2.8.3.1, pre-1992 is considered as the high growth phase and post 1992 is considered as the low growth phase.

Accordingly, to support our hypothesis 3a and 3b, we expect the following propositions to hold true.

a. The estimated MPC value for the pre-1992, high growth phase, should be lower than the estimated MPC value for the post 1992, low growth phase. That is $\gamma_{pre1992,1} < \gamma_{post1992,1}$.
b. In addition to proposition (a), the estimated MPC value pre-1992 should be significantly different from the estimated MPC value post 1992. That is $\gamma_{pre1992,1} \neq \gamma_{post1992,1}$

Table 6 shows the estimated results for equation (15). The MPC in the high growth phase pre-1992, takes the value 68.6 percent and is highly significant. And the MPC, in the low growth phase post 1992, takes a higher value 76.5 percent and is again highly significant. The estimated values for MPC in the two phases show that the proposition (a) holds, that the MPC value in the high growth phase is lower than the MPC value in the low growth phase. This result goes to support our hypotheses 3a and 3b. To test proposition (b), we perform a Chi square test to confirm that the two values are significantly different across the two phases of GDP growth, pre-1992 and post 1992. The Chi square test statistic significantly shows that the two coefficients, representing MPC values, are significantly different. This result, supports proposition (b).

Table 6
Regression Result for Marginal Propensity to Consume

Variables	**(1) Dependent Variable Real Consumption Pre 1992**	**(2) Dependent Variable Real Consumption Post1992**	**(3) Dependent Variable Real Consumption Post 1992 – Pre-1992**
Real GDP	0.686***	0.765***	.079***
	(0.0248)	(0.0159)	
Observations	20	25	
KPSS on residuals	0.261	0.129	
KPSS 5% critical value	0.463	0.463	
R-squared	0.980	0.992	

a. Robust standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1
b. The difference reported in column (3) is highly significant p<.001.

Therefore, we can conclude that:

High GDP growth in the first phase, pre-1992, is explained by high investment growth. And that the Marginal Propensity to Consume in this phase is low. Making this high GDP growth phase investment led. And that the low GDP growth in the second phase, post 1992, is again explained, by low investment growth. And the Marginal Propensity to Consume, in this phase is higher. Making this phase consumption led.

8. Conclusions

This paper attempts to address the long run determinants of trend GDP growth in Pakistan.

The theoretical framework chosen, has been a Keynesian general equilibrium framework (Keynes, 1937) of estimating and analyzing aggregate demand, decomposed into the macro aggregates of consumption, investment, government expenditures, exports and imports.

Our theoretical framework adopted gives three sets of hypotheses to explain Pakistan's GDP growth in the long run. Data considerations, of consistency and comparability, have made us choose out period of analysis to be 1973 to 2017.

The analytical strategy we have used is to establish first whether there has been a discrete drop in GDP growth at any particular break date. Establishing a break date allows us to define two periods of GDP growth, a higher growth period, followed by a lower growth period. The determinants of GDP growth can then be established, by looking for correlated changes in their behavior between the two time periods.

Hypothesis 1. There has been a discrete reduction in GDP growth over the time period 1973-2017.

To test Hypothesis 1 that there has been a discrete reduction in GDP growth between 1973 and 2017, we used a methodology of searching for a break in the series for real GDP growth rates. In support of Hypothesis 1, we found a significant structural break for the year 1992. Running a dummy regression for this known break date, found that GDP growth dropped by 1.84% after 1992.

Hypothesis 2a: There has been a significant drop in the investment growth over the time period 1973-2017.

Hypothesis 2b: Investment growth significantly explains high GDP growth in the first phase and a drop-in investment growth explains the drop in GDP growth in the second phase.

Support for Hypothesis 1 having established two distinct time periods, pre-1992 marked by high GDP growth, and post 1992 marked by low GDP growth, our analytical strategy has been to establish which of the explanatory macro aggregates follows this pattern of high GDP growth in the pre-1992 period, and low GDP growth in the post 1992 period.

Which implies using the same structural break methodology applied to GDP growth, now for a known break date of 1992, for our explanatory macro aggregates of consumption, investment, government expenditure, exports and imports.

And our findings show that on average GDP growth is observed to drop by 1.84 percent after the year 1992. Interestingly, we then observed a similar trend for investment growth, with a break in investment growth coinciding with the break in GDP growth. We then established that after 1992, on average investment growth drops by 3.11 percent,

Having established that of all the explanatory macro aggregates only investment growth had a significant drop post 1992, following the drop in GDP growth, we proceeded to the next step of testing whether GDP growth was indeed a function of its explanatory macro aggregates, as in Hypothesis 2b.

Where GDP growth, on the left-hand side, is explained on the right-hand side by investment growth, consumption growth, government expenditure growth, export growth and import growth. The hypothesis expected higher investment growth to explain higher GDP growth in the first phase, pre-1992, with a statistically significant drop in investment growth explaining the drop in GDP growth in the second phase, post 1992.

As expected, only the investment growth variable consistently explains GDP growth across the two time periods, pre 1992 and post 1992. The investment growth variable coefficient showed that a 1 percent increase in investment growth gave a 0.24 percent increase in GDP growth pre 1992. The coefficient of investment growth dropped post 1992 now giving a 0.17 percent increase in GDP growth. Both the coefficients were significant and positive in both the time periods. The investment growth coefficient had a higher value in the first phase pre 1992, and a lower value in the second phase post 1992. Further the drop in the investment growth coefficient was highly significant between the two phases, pre 1992 and post 1992.

Hypothesis 3: Growth in output will be better explained episodically, some cycles being more investment led, others more consumption led, and still others following more balanced growth paths.

Hypothesis 3a: High GDP growth in phase one, will not be equally explained by high investment growth and high consumption growth. If high GDP growth in phase one is explained well by high investment growth, then the Marginal Propensity to Consume in this phase will be low.

Hypothesis 3b: Low GDP growth in phase two, will then equally not be explained by both low investment growth and low consumption growth. If low GDP growth in phase two is explained by low investment growth, then the Marginal Propensity to Consume, in this phase will be high.

Having established that the drop in Pakistan's GDP growth between the two time periods pre-1992 and post 1992, is well explained by the drop-in investment growth, this paper has attempted to go further. The theoretical framework adopted of the Kahn Keynes (Keynes, 1937) investment multiplier being based on the Marginal Propensity to Consume (MPC), implied that there could be two channels working to determine long run GDP growth, an investment channel and a consumption channel.

A further nuance was added by the implication of the two channels having a possible tradeoff. If the MPC rises, savings fall, and therefore also domestic investment and potentially total investment. Which gives the possibility that different episodes of GDP growth could be investment led, or consumption led. We had already established the significance of the quantum of investment growth in explaining GDP growth. Therefore, our test for Hypothesis 3 had now to be based on estimating the MPC across two phases of GDP growth, pre-1992 with its high GDP growth, and post 1992 with its drop in GDP growth.

The MPC was estimated by running a regression of real consumption as a function of real GDP. The regression was run independently for the two time periods, pre-1992 and post 1992. The coefficient of real GDP in each regression gives the average value for the MPC for each time period, pre-1992 and post 1992.

The estimated results showed that the MPC in the high growth phase pre-1992, was 68.5 percent and highly significant. And the MPC, in the low growth phase post 1992, was 76.4 percent and again highly significant. We then ran a Chi square test which confirmed that the two coefficients, representing MPC values, were significantly different.

Therefore, we can conclude that:

High GDP growth in first phase, pre-1992, is explained by high investment growth. And that the Marginal Propensity to Consume in this phase is low, making this high GDP growth phase investment led. And that the Low GDP growth in the second phase, post 1992, is again explained by low investment growth. And the Marginal Propensity to Consume, in this phase is higher, making this phase consumption led.

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