61:4 (2022) pp. 583–601
DOI: 10.30541/v61i4pp.583-602

Total Factor Productivity and Economic Growth in Pakistan: A Five-Decade Overview

OMER SIDDIQUE

This paper traces Pakistan's TFP and GDP growth from 1972 to 2021. The analysis shows that Pakistan's TFP and economic growth have declined over time. The sectoral—agriculture, industry, and services—trends are also not different. The TFP and GDP growth rates of the total economy and the three sectors were the highest in the 1980s. In general, whenever TFP growth has increased, Pakistan's economic growth has also increased. The analysis further shows that whenever attempts were made to deregulate and liberalise the economy, it resulted in higher TFP growth and consequently higher GDP growth. Similarly, macroeconomic and political stability also seems to be important factors in higher TFP and GDP growth. The comparison with other countries shows that Pakistan's TFP growth performance has been reasonable, especially when compared with India. At the same time, however, the experience of other countries shows that to achieve GDP growth above 8 percent, Pakistan needs to enhance its productivity growth to 3 percent or above.

JEL Classifications: O4, D24, Q1, L60, L80
Keywords: Economic Growth and Aggregate Productivity, Total Factor Productivity, GDP Growth, Agriculture, Industry, Services

1. INTRODUCTION

The evolution of total factor productivity (TFP) is a key determinant of long-run output growth. There is substantial evidence available that shows that the countries that managed to boost their TFP grew at a much higher rate and for a sustained period. The Second Industrial Revolution resulted in unprecedented improvements in technology, altering human life in significant ways, and resulting in income increases that lasted well into the 20th century, as explained by Gordon (2016). For a much more recent period, Yalçınkaya, et al. (2017) show that in G7, G12, and G20 countries, TFP growth has a greater impact on GDP per capita growth than fixed capital formation and employed labour. According to Warren Buffet, TFP is the 'secret sauce' in the US economic success story over the last 150 years (Lambert, 2016). On the other hand, those countries that managed to grow impressively without the significant contribution from the TFP growth,

Omer Siddique <o.siddique@pide.org.pk> is Senior Research Economist at the Pakistan Institute of Development Economics, Islamabad, Pakistan.

Author's Note: This paper is an updated version of PIDE Working Paper No. 2020:11 with the same title. Thanks are due to Dr Nadeem Ul Haque, Vice-Chancellor, PIDE, for the ideas, motivation, and encouragement to undertake this analysis. Thanks are also due to anonymous referees for comments and suggestions for the improvement of the paper. The errors and omissions are author's.

could not sustain their growth. Economic growth that is based on the expansion of inputs rather than on an increase in output per unit of input is inevitably subject to diminishing returns. Impressive economic growth in the Soviet Union in the 1950s and the 1960s, for example, was based entirely on savings. Therefore, unless the economies do not learn to produce more and better output more efficiently, they will suffer the law of diminishing returns (Krugman, 1994).

The TFP reflects a shift in the production function arising from technological progress (Barro, 1999). It may also increase economic growth by allocating inputs more appropriately and efficiently, resulting in production getting very close to the optimum combination of inputs and outputs (Balk, 2001). A country may produce at the production possibility frontier but improvements in technology push the frontier out and enable more output to be produced for given factors of production. The concept of TFP growth essentially incorporates technical change and improvements in economic efficiency in the use of factor inputs. The TFP may also contribute to higher economic growth through the effect that economies of scale have on changing the scale of operations (Jorgenson and Griliches, 1967). According to Bosworth and Collins (2008), the TFP not only measures technical efficiency but can also be attributed to several sociopolitical and economic factors, such as government policy, institutions, market structure, or weather shocks that determine the efficiency of factor use.

Keeping in view the importance of TFP growth for long-run economic growth, in this paper, an account of Pakistan's output and TFP growth rates for the total economy as well for three main sectors, viz. agriculture, industry, and services sectors is presented. A contribution of this paper is that it uses data at 2015-16 constant prices for the whole economy as well as for three main sectors, i.e., agriculture, industry, and services. To the best of our knowledge, this has not been done so far for Pakistan. Secondly, we used data till 2021, which is the latest year for which the final data (final means revised and final figures and not provisional figures) are available. Therefore, this paper presents an updated and latest account of TFP growth in Pakistan's economy.

The paper is organized as follows. In Section 2, methodology and data are discussed. Section 3 presents trends and analyses of the GDP growth rate, TFP growth rate, and investment-GDP ratio are presented for the total economy. In Section 4 the contribution of TFP and factor inputs are discussed, while Section 5 presents a comparison of Pakistan's TFP and output growth with selected countries. The sectoral output and TFP growth, and investment trends are discussed in Section 6, while Section 7 summarises the intersectoral comparison. The discussion is summarised in Section 8.

2. METHODOLOGY AND DATA

2.1. Methodology

In this paper, total factor productivity (TFP) is estimated using the standard growth framework based on the neoclassical production function of the following form:

$$Y = F(A, K, L) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

In Equation 1, Y is real output, K is capital stock, L is the employed labour force, and A is the residual term, which is the TFP.

Equation 1 can be written in the growth form as follows:

$$g^Y = \alpha g^L + (1 - \alpha) + g^{TFP} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

g^Y denotes the growth rate of output, g^L denotes the growth rate of labour, g^k denotes the growth rate of capital, g^{TFP} denotes the growth rate of the TFP, α is the share of labour in output, and *(1-α)* is the share of capital in output. According to Equation 2, the output growth rate is a weighted average of growth in the employed labour force, capital stock, and technological progress, given by the growth of the TFP, and the weights are shares of labour and capital.

Assuming that output and inputs can be observed, the TFP can be calculated using the following equation:

$$g^{TFP} = g^Y - \alpha g^L - (1 - \alpha) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

The TFP can be estimated using either regression techniques or the growth accounting framework. For our analysis, the growth accounting framework is used, assuming that the output in the economy can be approximated by constant returns to scale Cobb-Douglas production function.

Following Romer (1990), a human capital variable is also added to the model. The, thus, becomes:

$$Y = (K)\ (LH)^{(1-\alpha)} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

In the above equation, all the variables are the same as in Equation 1, except for LH, which is the human capital-augmented employed labour force. This variable captures increases in labour productivity as a result of educational attainment and is calculated by using the mean years of schooling. We assume that an additional year of education raises the level of productivity by 7 percent following López-Cálix, et al. (2012).

Writing Equation 4 in the growth form, it becomes:

$$\Delta \ln (Y) = \alpha\ [\Delta \ln (K)] + (1 - \alpha)[\Delta \ln(LH)] + \Delta\ln(A) \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

Using Equation 5, TFP growth is estimated as:

$$\Delta\ln(A) = \Delta \ln (Y) - \alpha\ [\Delta \ln (K)] - (1 - \alpha)[\Delta \ln(LH)] \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

Different studies assume different factor shares. For the analysis in this paper, using data from the Asian Productivity Organisation, the share of capital is assumed to be 0.5008 and that of labour 0.4992.

2.2. Data

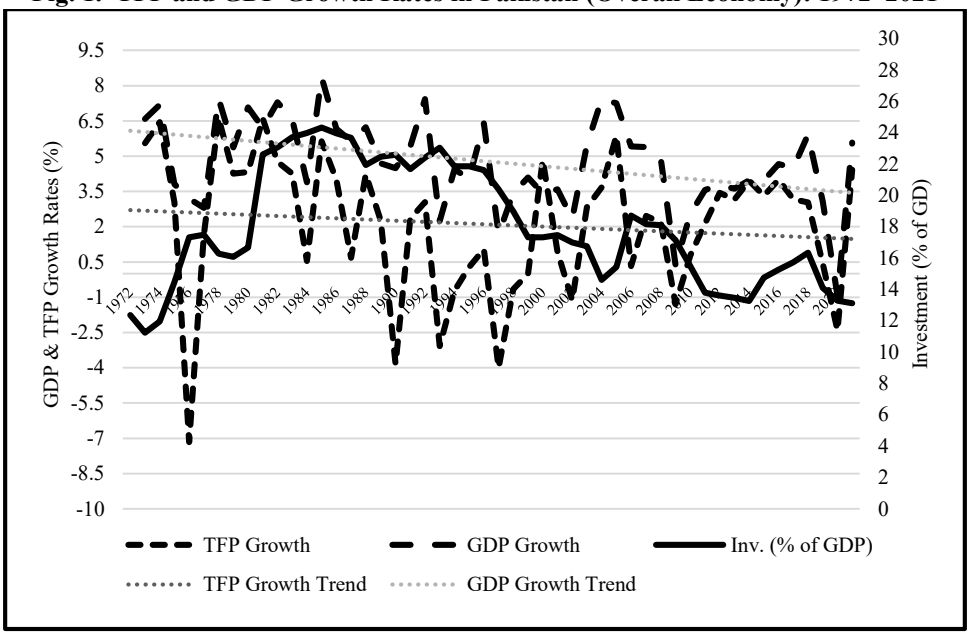
The data used in the analysis is at 2015-16 constant prices. Data on GDP (total economy and its sectors, i.e., agriculture, industry, and services) gross fixed capital formation (GFCF) (total economy and its sectors, i.e., agriculture, industry, and services) and employed labour force (total economy and its sectors, i.e., agriculture, industry, and services) are obtained from various issues of the Pakistan Economic Survey. Since data for the entire period of analysis (1972-2021) is not available at one base, the data at older bases (1959-60, 1980-81, 1990-00, and 2005-06) are converted to 2015-16 constant prices using the splicing method. Values for some years are missing, especially for the employed labour

force and human capital, which are interpolated. The capital stock series is estimated using data on the GFCF at constant prices and depreciation rate (δ). The data on the depreciation rate is obtained from Penn World Tables (PWT 10.0). The proxy used for human capital is the average years of schooling, which is obtained from PWT 10.0. The capital stock is estimated using the standard perpetual inventory method (PIM), which is the most widely used method to estimate capital stock. The details of estimating the capital stock are given in the Appendix.

3. EVERY FIGURE TELLS A STORY—DECLINING TRENDS IN TFP, GDP, AND INVESTMENT

Figure 1 tells the story of Pakistan's declining output and TFP growth rates since 1972. The fact that Pakistan's growth experience has been erratic and that the long-term growth rate is on a downward spiral is now well established. The analysis herein reaffirms these facts. Figure 1 clearly shows declining trends in the GDP growth rate, the TFP growth rate, and in investment as a percentage of GDP. According to our estimates, the TFP grew, on average, at 1.77 percent per annum, which is reasonable when compared internationally. However, the figure clearly shows the volatility in GDP and TFP growth rates—brief spurts followed by slumps. It also shows that GDP and TFP growth rates, and investment as a share of GDP have followed the same path. In other words, whenever the TFP growth has increased, there has also been an improvement in the GDP growth rate and vice versa. Though it does not establish causality, the literature and experiences of other countries show that TFP growth leads GDP growth. In Pakistan's case as well, there is an indication of a strong relationship between TFP and GDP growth rates. This implies that TFP growth has led GDP growth in Pakistan.

Fig. 1. TFP and GDP Growth Rates in Pakistan (Overall Economy): 1972–2021



Source: Author's estimations.

The downward trend of Pakistan's GDP and TFP growth rates since the 1970s illustrates the structural weaknesses that have plagued its economy. The inconsistent economic performance is indeed a puzzle despite various reform efforts undertaken, with support from international agencies and institutions. It highlights little or no impact of these reforms on improving structural weaknesses and economic efficiency. Table 1 shows the growth rates of GDP and TFP during the overall period (1972-2021) and different decades. Pakistan's average economic growth during the last 49 years (1972–2021) has been anaemic 4.75 percent.

Table 1

Sources of Growth in Pakistan's Economy:1972-2021

	Annual Average Growth (%)				Annual Average
Period	GDP	Capital	Labor	TFP	Investment (% of GDP)
1972-2021	4.75	3.14	2.82	1.77	17.96
1972-1980	5.06	0.13	5.14	2.44	14.87
1981-1990	6.00	5.89	0.47	2.81	23.23
1991-2000	4.01	5.35	3.53	–0.43	20.65
2001-2010	5.06	1.23	4.62	2.13	16.88
2011-2021	3.92	–0.12	2.61	2.68	14.24

Source: Author's estimations.

As Table 1 indicates, GDP, TFP, and capital grew at the highest rates during the 1980s. The growth rate of employed labour was below 1 percent during that period. Hallmarks of this period were halting the nationalisation regimes of the 1970s and the revival of private industrial investment (Anjum & Sgro, 2017). It is argued that although there were not many reforms in the 1980s, the industrial policy framework emphasised the role of the private sector and greater import liberalisation of industrial raw materials (Mahmood, et al. 2008). However, it is also argued that the impressive economic performance of the 1980s was not due to sound economic policy or institutional reforms, it rather came on the back of the large public sector investments made in the 1970s, such as Tarbela Dam, fertiliser, and cement factories (Husain, 2010). Table 1 also shows that TFP was the highest in the period (the 1980s) when the investment-GDP ratio was also the highest at 23.23 percent. The role of investment is important because innovations, R&D, and new technology are embodied in the new investment, which helps the TFP grow and thereby boost economic growth.

In the 1990s, also sometimes remembered as Pakistan's "lost decade", the economy took a turn for the worse: TFP growth turned negative at –0.43 percent and the GDP growth rate, unsurprisingly, declined to 4.01 percent. There are many explanations, such as soaring external and public debts, for the lacklustre performance of Pakistan's economy during the 1990s. Although significant liberalisation reforms were introduced in the 1990s, the policy environment was unstable in terms of rules, taxes, and import tariffs. Particularly, the policy environment was dominated by the arbitrary use of statutory regulatory orders (SROs), which affected the level playing field.

López-Cálix, et al. (2012) argue that the decline in TFP growth in the 1990s—a period of trade liberalisation and other economic reforms—was not caused by trade liberalisation, but by what they see as poorly sequenced economic reforms together with macroeconomic instability and the failure of policymakers to implement and sustain reforms. They note that financial sector reforms in the 1990s were implemented before substantial reforms on the fiscal side. As a result, during the 1990s government finances were under stress due to higher borrowing costs emanating from financial liberalisation. They conclude that unless Pakistan's record in structural reforms improves, the TFP will not improve and that "reform is fragmented and littered with a myriad of policy reversals (p. 11)."

According to Hussain (2010), the 1990s were marred by poor macroeconomic management and political instability. Due to these reasons, the policies of economic liberalisation, deregulation, and privatisation could not affect growth positively. Although many liberalising steps were taken, such as the removal of non-tariff barriers, due to political uncertainty and frequent changes of governments, it did not translate into higher economic growth.

In fact, the poor performance of the economy in the 1990s is often attributed to macroeconomic imbalances carried over from the 1980s. During the 1980s, defence spending increased by 9 percent per annum which resulted in the soaring debt burden in the 1990s. Coupled with high defence expenditures, low development spending, which rose by 3 percent per annum, also contributed to slow growth in this "lost decade".

The TFP growth rate improved during the 2000s to 2.13 percent and so did the GDP growth rate, which was 5.06 percent. The improvement in the growth rate in the 2000s can be attributed to improvements in stabilisation policies and, most importantly, to structural reforms. There were improvements in trade openness and financial depth. It is argued in the literature that the growth in the 2000s took place due to better macroeconomic fundamentals, structural reforms, institutions, governance, and private sector dynamism (Muslehuddin, 2007). Certain structural reforms, i.e., financial sector restructuring, privatisation, liberalisation and deregulation of the economy and bank reforms, leading towards a market-led economy, were undertaken. The privatisation process was pursued; the focus was on banking, telecommunication, oil and gas and the energy sector. The relaxation of sanctions post-September 2001, which were imposed in the wake of nuclear detonations in 1998, also helped improve the economic conditions in the 2000s. Pakistan also received significant funding from the US for supporting the War on Terror. Overall, a favourable external environment led to improvements in TFP and GDP growth rates.

In the 2010s, the GDP growth declined to 3.92 percent from 5.06 percent in the 2000s. What is surprising though is the impressive growth rate, by Pakistan's standards, of the TFP. It grew at 2.68 percent during this period, which is higher than TFP growth rates in all the decades except for the 1980s. In the 2010s, the TFP growth rate accounted for almost half of the GDP growth during the decade. It may reflect the growing contribution of the services sector to Pakistan's economy, which requires less investment as compared to the industrial sector. Moreover, an increase in capacity utilisation, especially in the latter half of the decade, which was lying idle due to the energy crisis in the first part of the 2010s could have also contributed to an increase in TFP growth during the decade.

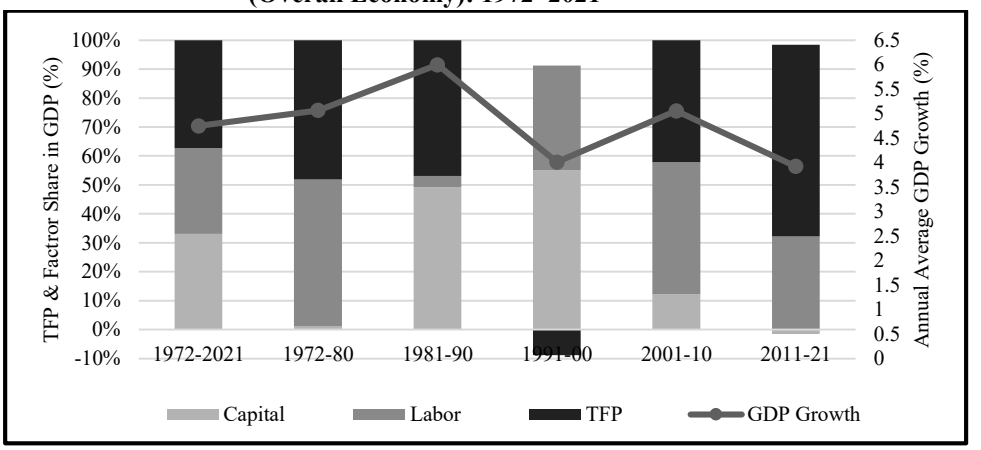
According to the literature on Pakistan's growth experience (see, for example, Favaro & Koehler-Gieb, 2010; Husain, 2010; World Bank, 2010; López-Cálix et al., 2012),

high productivity growth periods coincide with periods of deregulation, especially in finance and insurance. The same could be the reason for high TFP growth in the 2010s despite a low investment-GDP ratio and modest GDP growth. In the 2000s quite a few reforms were undertaken to liberalise the financial sector of Pakistan. The increase in TFP growth during the 2010s may have been a result of liberalisation undertaken in the preceding decade. For example, tariffs were rationalised in 2005-06. Similarly, the financial sector was liberalised considerably during the 2000s, which perhaps bore fruits in the 2010s, which is evident from impressive TFP performance during the decade.

4. INPUT AND TFP CONTRIBUTION TO GDP GROWTH

Figure 2 below shows the relative contributions of TFP and factor inputs to GDP growth rates from 1972 to 2021 and decade-wise. As the figure indicates, whenever average TFP growth increased in a decade, Pakistan's GDP growth also followed suit, an exception being the 2010s. During the 1990s, the GDP growth rate declined from 6 percent in the 1980s to 4 percent, which is reflected in a negative contribution of the TFP contribution to GDP growth. In the 2010s (2011-2021), although TFP growth increased, GDP growth registered a decline. Capital input contributed the most in the 1990s. It contributed approximately 67 percent of the GDP growth during the decade. Labour's contribution was the highest during the 1970s at approximately 50 percent, whereas the labour input's contribution was the lowest (3.91 percent) in the 1980s. For the entire period (1972-2021), factor inputs contributed almost 67 percent to GDP growth whereas the rest 33 percent was contributed by TFP growth.

Fig. 1. Share of TFP and Factor Inputs in GDP Growth (Overall Economy): 1972–2021



Source: Author's estimations.

The contribution of human capital-augmented labour to output growth has been low for a labour-intensive country such as Pakistan. The modest contribution of labour input is also observed by others, including Amjad & Awais (2015) and López-Cálix, et al. (2012). The low contribution of labour may be due to low levels of average years of schooling, i.e., human capital in the economy. Although the employed labour force has grown over the years, the growth in human capital has been modest, which grew by 2.76 percent from 1972 to 2021.

As shown in Table 2, Pakistan's low TFP growth rate is also documented by various other studies. The studies cited in Table 2 report the TFP growth rate ranging from 1.08 percent (Saleem, et al. 2019) to 2.2 percent (Pasha, et al. 2002). The contribution of TFP to GDP growth rate ranges from 22.59 percent (Saleem, et al. 2019) to 40 percent (Pasha, et al. 2002). A word of caution is warranted, though, when comparing the results of different studies. There is a vast literature on growth accounting that points out that TFP estimates are highly sensitive to the period of analysis, data used, base period, factor shares, and the methodology employed (see, for example, Srinivasan, 2005 & Hulten, 2000). The above caveat notwithstanding, the analysis of sources of growth in the economy's main sectors (agriculture, industry, and services) further corroborates low TFP growth in Pakistan resulting in low GDP growth.

Table 2

Total Factor Productivity in Pakistan: Cross-Study Comparison

Study	Period	GDP Growth (%)	TFP Growth (%)	TFP Contribution (%)	Factor Input Contribution (%)
Saleem, et al. (2019)	1976-2016	4.78	1.08	22.59	77.41
Amjad & Awais (2015)	1980-2015	4.80	1.70	35.42	64.58
López-Cálix, et al. (2012)	1980-2010	5.00	1.40	28.00	72.00
Chaudhry (2009)	1985-2005	4.10	1.10	26.83	73.17
Sabir & Ahmed (2003)	1972-2002	5.10	1.80	35.29	64.71
Pasha, et al. (2002)	1973-1998	5.50	2.20	40.00	60.00
This study	1972-2021	4.75	1.77	37.30	62.70

5. INTERNATIONAL COMPARISON

Pakistan's TFP growth rate, compared internationally, is not very low. As can be seen from Table 3, Pakistan's TFP growth rate of 1.77 percent from 1972 to 2021 was only lower than that of Taiwan, which was 2.39 percent during 1970-2020. Despite a reasonable TFP growth rate, Pakistan's GDP growth has remained below par. On the other hand, India, despite having a lower TFP growth rate than Pakistan, grew at above 5 percent per annum from 1970 to 2020. However, the decade-wise breakdown of TFP and GDP growth rates shows that higher TFP growth rates have been accompanied by high GDP growth rates. For example, in the 1980s, a higher TFP growth rate in Pakistan was accompanied by a higher GDP growth rate. South Korea grew by over 10 percent when its TFP growth rate was above 3 percent in the same decade. The other decades show a similar pattern. However, as mentioned above, in the 2010s, although Pakistan's GDP growth declined, its TFP growth rate increased, whereas other countries' TFP growth as well as GDP growth declined from the previous decade.

Table 3

GDP and TFP Growth Rates (%): Cross-Country Comparison

	1971-2017		1971-1980		1981-1990		1991-2000		2001-2010		2011-2017	
Country	GDP	TFP	GDP	TFP	GDP	TFP	GDP	TFP	GDP	TFP	GDP	TFP
Pakistan	4.75	1.77	5.06	2.44	6.00	2.81	4.01	–0.43	5.06	2.13	3.92	2.68
India	5.43	1.66	3.30	0.01	5.01	1.84	5.65	2.26	8.01	2.60	5.76	2.04
China	7.98	1.54	4.67	–0.73	8.58	2.35	8.63	1.98	9.98	2.35	5.67	1.05
South Korea	7.12	1.30	9.86	1.65	10.31	2.36	6.49	1.63	4.55	0.92	2.55	0.74
Taiwan	6.76	2.39	10.08	3.06	9.19	3.99	6.51	2.09	4.63	1.71	2.79	1.00

Source: For Pakistan, the estimates are based on our calculations from 1972 to 2021. For other countries, the estimates are based on the Asian Productivity Organization (APO) dataset 2022.

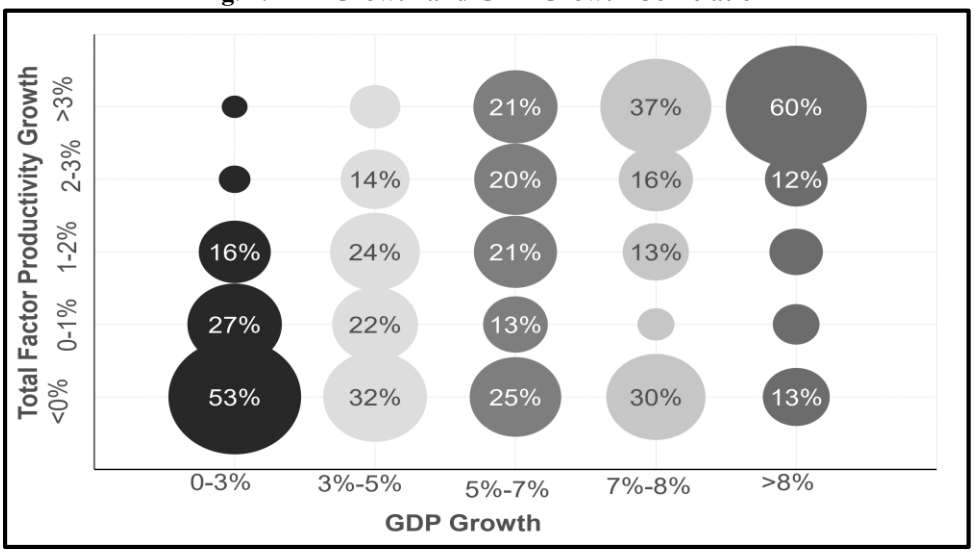
Note: For Pakistan, the period is 1972-2021.

As regards India, one reason for low TFP growth in the Indian economy could be that the TFP growth in its manufacturing and agriculture sectors has been low, pulling down the overall TFP growth. Economic growth in India picked up in the 1990s, which was due to, among other things, the remarkable performance of its services sector. The TFP growth in India's services sector has been impressive, averaging 3.9 percent during 1993–2004 (Bosworth & Collins, 2008).

Therefore, international evidence suggests that to achieve and sustain high growth rates, productivity improvement is crucial. It is especially important for developing countries, such as Pakistan, which are far away from the productivity frontier. In the case of developed countries, such as Japan or the US, the productivity slowdown or stagnation does not matter much because they are already at or near the productivity frontier. Their higher standards of living have been achieved through technological progress.

The importance of TFP growth for high GDP growth is highlighted by Citi GPS (2018) report. The report shows that a 3 percent growth in TFP is a good threshold to explain high GDP growth economies. As shown in Figure 3, in 60 percent of the economies that experienced GDP growth of more than 8 percent, TFP growth was more than 3 percent. Conversely, TFP growth higher than 3 percent ensured that in at least 50 percent of the cases, the GDP growth for that year exceeded 8 percent.

Fig. 2. TFP Growth and GDP Growth Correlation



Source: TED, Citi Research [Citi GPS (2008)].

Note: Bubble size represents the percentage of instances at different levels of GDP growth. For example, if GDP growth is higher than 8 percent, then in 60 percent of cases TFP growth is greater than 3 percent.

If TFP growth was between 2-3 percent, then in 66 percent of the sample points, GDP growth was between 3-7 percent. Sustained average TFP growth of more than 3 percent was achieved only by China in the 1980-2010 period. Some other countries have sporadically achieved such sustained growth in TFP, such as Japan (the 1960s), Germany (the 1950s), Brazil (the 1950s and the 1970s), and Turkey (the 1950s and the 1960s). Sustaining TFP growth above 3 percent over a longer period, however, is a difficult task.

6. DIGGING DEEPER—SECTORAL OUTPUT AND TFP GROWTH

6.1. Agriculture

During 1972-2021, the agriculture sector contributed around 29 percent to the GDP and absorbed almost 47 percent of the employed labour force. Over the years, agriculture's share in Pakistan's economy has contracted. During the 2011-21 period, the agriculture sector's share, on average, in the economy has come down to almost 24 percent and the employed labour's share has reduced to 42 percent. Despite its declining share in output and employment, it is still an important sector. It is a source of livelihood for a major segment of Pakistan's population and fulfils the food requirements of the country. It is also a source of raw materials for other industries in Pakistan. Besides, the sector also has linkages with small-scale industries, such as motorcycles and other consumer goods.

Table 4 shows the sources of growth and investment-GDP ratio in agriculture. The decline in the share of the agriculture sector is a stylised fact and is often accompanied by an increase in TFP growth (Favaro & Koehler-Geib, 2009). However, this is not the case for Pakistan. In the agriculture sector, the TFP growth throughout the analysis period was a mere 0.67 percent. Looking at the sub-periods shows that TFP growth has fluctuated widely, ranging from –0.88 percent (the 1970s) to 1.18 percent (2010s).

Table 4

Sources of Growth in the Agriculture Sector in Pakistan

	Annual Average Growth (%)				Investment
Period	Output	Capital	Labor	TFP	(% of GDP)
1972-2021	3.34	5.27	2.03	0.67	4.15
1972-1980	2.68	–0.38	4.54	–0.88	1.25
1981-1990	4.04	15.51	0.04	0.90	7.84
1991-2000	4.18	3.87	3.86	0.32	5.16
2001-2010	3.06	1.68	4.68	–1.02	3.32
2011-2021	2.29	2.48	0.77	1.18	3.03

Source: Author's estimations

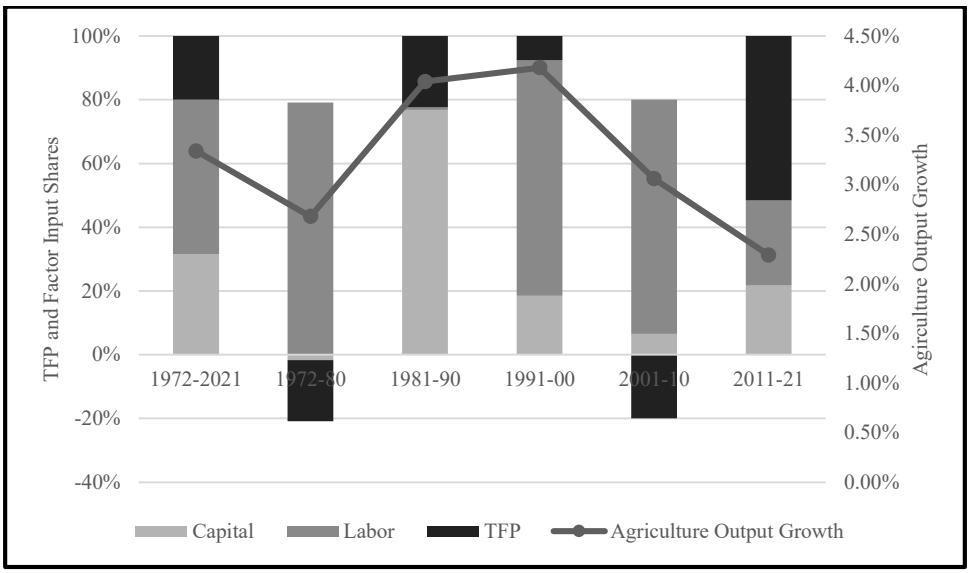
The overall TFP growth rate in the agriculture sector (0.67 percent) in our analysis is similar to what other studies report but the sub-period TFP growth and the share of TFP in agriculture output growth (Figure 4) vary widely across studies. That is due to the different periods chosen as well as the use of different datasets.

The TFP growth turned positive in the 1980s from negative growth in the 1970s. The negative TFP growth in the 1970s may be attributed to the then government's nationalisation programme, which kept the production and distribution of key farm products to itself. The benefit of the rupee's devaluation was also not transferred to the agricultural sector. The agriculture sector was subject to export duties and government monopolies. In the 1980s, as Amjad & Awais (2015) have noted, the better performance of agriculture was partly due to the availability of credit to the farmers, especially to small farmers. This reform increased the use of fertilisers and pesticides. Furthermore, input distribution was liberalised encouraging private firms to distribute and produce these inputs, which were previously subject to many government controls. Several high-yield

varieties were also introduced in the 1980s that contributed to better performance of the agriculture sector in the 1980s as well as in the 1990s.

Although the agriculture sector's performance was respectable in both these decades, Figure 4 shows that the main contributors to the agriculture output growth have been labour—overall as well as in the 1980s, the 1970s, the 1990s, and the 2000s. In the period 2001–10 again, the agriculture growth rate declined to just over 3 percent and the TFP growth rate turned negative. One of the main reasons for the lacklustre performance of agriculture in this decade was drought-like conditions in the earlier half of this decade. High energy costs, resulting in high fertiliser prices also contributed. The period 2011–21 paints an interesting picture. In this period although the agriculture sector grew at a very modest 2.29 percent and the investment was only 3.03 percent of the GDP, the TFP grew at 1.18 percent. TFP growth's contribution to the agriculture output growth in the 2010s is also the highest among all the decades at 51.54 percent.

Fig. 3. Share of TFP and Factor Inputs in Agriculture Output GDP Growth: 1972–2021



Source: Author's estimations.

Due to the potential benefit of the agriculture sector for large parts of the population, addressing the low productivity in agriculture is very important. The literature has identified numerous reasons, but the major reasons are still high levels of government intervention in the production and marketing of crops, low level of education of the rural population, and poor development of the service interface linking farmers to markets. The modern business farm sector or the commercial interface between farmers and industry is not very developed in Pakistan. The presence of such an interface in most countries allows farmers to focus on producing crops and outsourcing outsource supporting services, such as the selection of appropriate seeds, fertilisers, and pesticides, mechanical support to plant and harvest crops, financing of crops, and transportation to farmer cooperatives, associations, or private corporations (Favaro & Koehler-Geib, 2009).

6.2. Industry

The industrial sector, which includes the manufacturing sector, is supposed to be the linchpin of economic activity as structural change takes place. In Pakistan, however, this has not been the case. The share of industrial output in GDP has increased from 18.37 percent in 1972 to only 18.90 percent in 2021. Similarly, the total labour force employed by the industrial sector has increased from 16.7 percent to only 25.3 percent in 2021. As can be seen from Table 5, the performance of the industrial sector since 1972 has been modest, except for in the 1980s when the sector grew at 7.35 percent, on average. The TFP growth rate for the entire period was 1.94 percent.

Table 5

Sources of Growth in the Industrial Sector in Pakistan

	Annual Average Growth (%)				Investment
Period	Output	Capital	Labor	TFP	(% of GDP)
1972-2021	5.30	3.14	3.59	1.94	5.91
1972-1980	6.13	0.13	6.95	2.60	4.66
1981-1990	7.35	5.89	1.99	3.41	8.78
1991-2000	3.45	5.35	2.42	–0.43	8.75
2001-2010	6.01	1.23	5.30	2.75	5.01
2011-2021	3.43	–0.12	4.22	1.39	2.58

Source: Author's estimations.

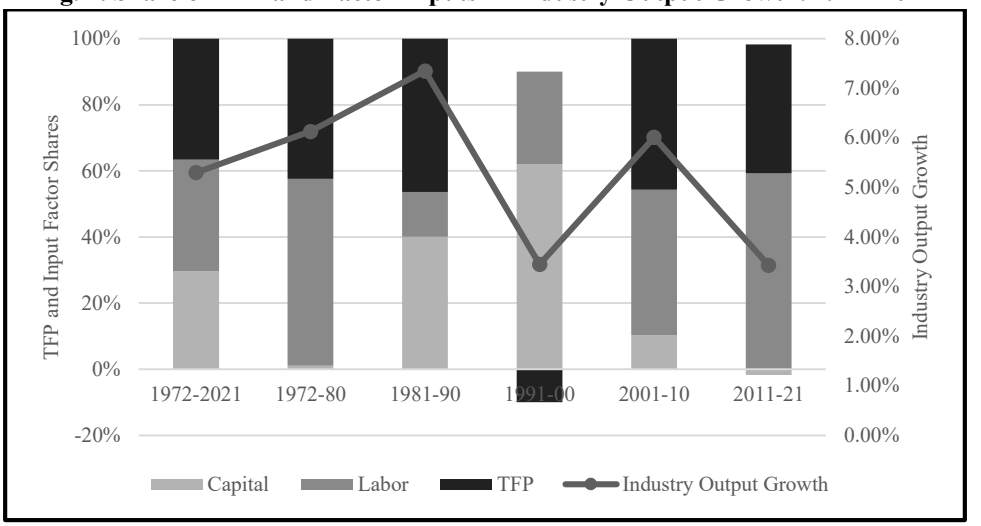
The highest output and TFP growth were observed in the 1980s, which is also the period when the investment-GDP ratio was the highest. The 1990s saw a sharp downturn in industrial output growth and the TFP growth turned negative during this period. Starting from this decade, the investment-GDP ratio in the industrial sector started to decline. Activity in the industrial sector picked up in the decade that followed, i.e., in the 2000s. The industrial output grew at 6.01 percent and the TFP grew at 2.75 percent. The dynamics of the growth in this decade, as also observed by Amjad and Awais (2015), are difficult to explain because the investment-GDP ratio declined from 8.75 percent in the 1990s to 5.01 percent. The capital grew marginally at 1.23 percent but the labour force grew at 5.30 percent. This could be due to the engagement of the idle capacity resulting from a high investment-GDP ratio in the preceding decade. This could also be due to data issues but what is important to note is that there is a strong correlation between output growth and TFP growth.

The last period, i.e., 2010 to 2021 presents an even more intriguing case. During this period although output growth in the industrial sector declined to 3.43 percent, TFP growth, though lower than in the previous decade, is 1.39 percent. The investment rate has also declined in this period to 2.58 percent of GDP.

Figure 5 shows the shares of TFP growth and factor inputs in GDP growth in the industrial sector. The figure clearly shows that the contribution of TFP growth to output growth has been consistently high in the industrial sector, barring the 1990s, when it was negative. Consistent with the overall economy and the agriculture sector, during 2011–21, although the industrial sector's output growth declined sharply to 2.58 percent, TFP growth remained at a respectable 1.39 percent. As Figure 5 further shows, the contribution of

capital in the industrial sector has been modest except for in the 1990s when it contributed over 77 percent to industrial output growth. On the other hand, labour's contribution has remained between 44 percent and 61 percent, except for in the 1980s when it was as low as 13.52 percent.

Fig. 4. Share of TFP and Factor Inputs in Industry Output Growth: 1972–2021



Source: Author's estimations.

6.3. Services

The services sector of Pakistan has become the most important sector in terms of its share in the GDP, which has increased to almost 56 percent in 2011-2021 from about 47 percent in the 1970s. It also employs 35.10 percent of the total employed labour force, up from 26.79 percent in the 1970s. The average output and TFP growth in this sector from 1972 to 2021 was 5.15 percent and 0.42 percent, respectively. The decade-wise patterns are quite similar to those observed in the industrial sector. The output growth rate was high at 6.46 percent in the 1980s, which dropped down to 4.15 percent in the 1990s. The TFP growth rate also turned negative to –0.45 percent. In the subsequent period, however, both the output and TFP growth rates picked up.

Table 6

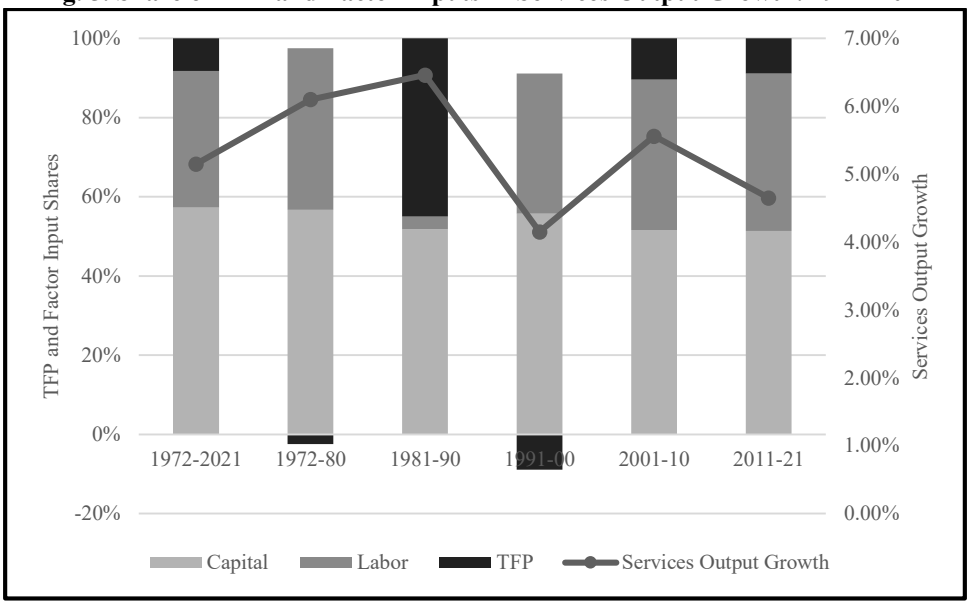
Sources of Growth in the Services Sector in Pakistan

	Annual Average Growth (%)				Investment
Period	Output	Capital	Labor	TFP	(% of GDP)
1972-2021	5.15	5.90	3.56	0.42	8.27
1972-1980	6.10	7.27	5.25	–0.16	8.37
1981-1990	6.46	6.68	0.42	2.91	8.32
1991-2000	4.15	5.61	3.57	–0.45	7.76
2001-2010	5.56	5.73	4.23	0.58	8.73
2011-2021	4.65	4.77	3.71	0.41	8.18

Source: Author's estimations.

During the 2011-2021 period, the output growth rate of the services sector decreased from 5.65 percent in the 2000s to 4.65 percent. The TFP growth rate also decreased from 0.58 percent to 0.41 percent. This pattern of a decrease in both output and TFP growth rates is opposite to the trends in the total economy, agriculture, and industry sectors. On average, the contribution of TFP to output growth was 28.04 percent, which means that in the services sector, the output growth is mainly input driven. The contribution, however, has fluctuated between decades. The highest contribution was in the 1980s and the lowest in the 1990s. On average, the capital input has contributed more to the output growth in the services sector as compared to the labour input.

Fig. 5. Share of TFP and Factor Inputs in Services Output Growth: 1972–2021



Source: Author's estimations.

Despite having the highest investment-GDP ratio among the three sectors, the services sector's performance has been underwhelming. This fact is also highlighted by others, including Amjad & Awais (2015), López-Cálix, et al. (2012), and Pasha, et al. (2002). To understand why TFP growth in the services sector has been low compared to the agriculture and industrial sectors, it is helpful to look at the investment in the subsectors of the services sector.[1] According to the data, the highest investment in the subsectors of the services sector is in the housing services[2] followed by the general government services.[3] In the 2010s, for example, the investment in housing services and general government services averaged about 60 percent of the total investment in the services sector. The financial services sector, which is perhaps the most productive among the services, has the

[1]The subsectors are the following: (i) wholesale and retail trade, (ii) transport, storage, and communication, (iii) finance and insurance, (iv) housing services (including ownership of dwellings), (v) general government services, and (vi) other private services.

[2]The housing services include services provided to tenants as well as (imputed) services provided to the owner of the dwelling.

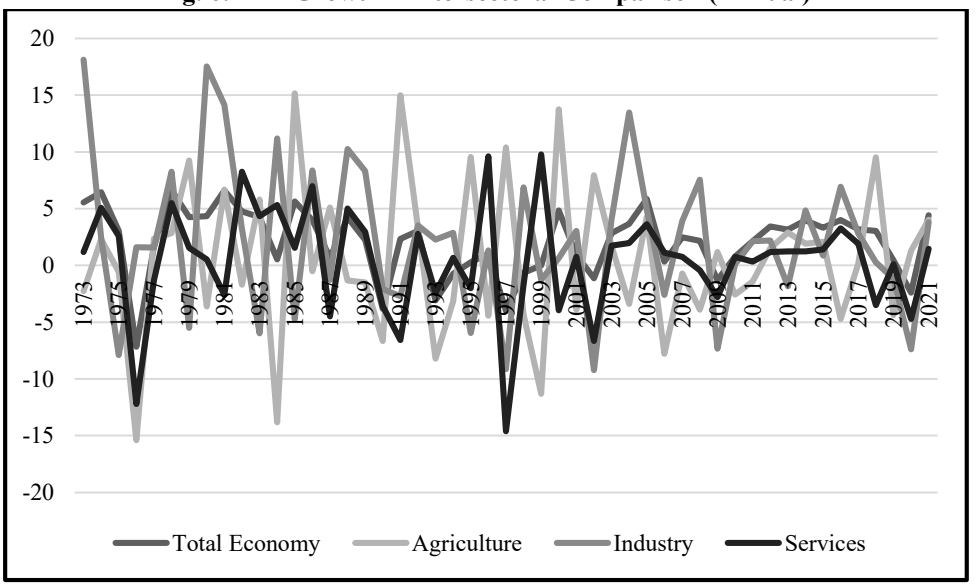
[3]The general government services include public administration and defense services, among others.

lowest investment in the services sector in Pakistan. Both housing services and general government services, although important in terms of their share in the output, are low-productivity sectors. This is perhaps the reason that despite having the highest investment-GDP ratio, TFP growth in the services sector has been low.

7. INTERSECTORAL COMPARISON

TFP growth in different sectors has followed almost the same pattern from 1972 to 2021, as shown in Figure 7 below. There are only a few years in which sectoral TFP growths, especially that of industry and agriculture, moved in the opposite direction. This becomes clearer in Table 7, which presents decade-wise annual averages of TFP growth rates for the total economy and sectors as well. Table 7 shows that the TFP growth rates in different sectors have followed the same path. from the 1990s to the 2000s, TFP growth in the services sector increased from –0.45 percent to 0.58 percent and also in the industrial sector from –0.43 percent to 2.75 percent. On the other than, the TFP growth in the agriculture sector declined from 0.32 percent to –1.02 percent.

Fig. 6. TFP Growth—Intersectoral Comparison (Annual)



Source: Author's estimations

Table 7

TFP Growth — Intersectoral Comparison (Decade-Wise)

	Total Economy	Agriculture	Industry	Services
1970s	2.44	–0.88	2.60	–0.16
1980s	2.81	0.90	3.41	2.91
1990s	–0.43	0.32	–0.43	–0.45
2000s	2.13	–1.02	2.75	0.58
2010s	2.68	1.18	1.39	0.41

Source: Author's estimations.

The reasons for the slump in the agriculture output and TFP growth in the 2000s include drought-like conditions in 2000 and 2001, hostile weather conditions, power cuts, an increase in energy prices that led to an increase in fertiliser prices, and a significant decrease in investment in the agriculture sector. As noted above, the reason for the increase in industrial output and GDP growth rate during the 2000s was structural reforms that led to trade and financial sector openness. Besides, there was macroeconomic and political stability in that period which was missing from the 1990s. As regards the services sector, it also witnessed an increase in output and TFP growth though not as pronounced as in the industrial sector.

8. SUMMING UP AND KEY TAKEAWAYS

Framework for Economic Growth (FEG) concludes that the most crucial problem for Pakistan's growth challenge is its abysmally low productivity (Planning Commission, 2011). It has been almost 11 years since the FEG was published and our analysis shows that Pakistan's GDP and TFP growth are declining. Our results are broadly in concordance with the results found in other studies.

The main results of the analysis are that, on average, whenever TFP growth has increased, Pakistan's economic growth has also increased. On the other hand, whenever factor inputs' share in GDP growth has been more than TFP growth's contribution, the GDP growth has declined, for example, in the 1990s. However, the agriculture sector was an exception in this regard in the 1990s. In the 1990s, the contribution of labour input increased and so did the agricultural output growth. In general, the labour input has contributed the most to the agriculture output growth, except for in the 1980s. On the other hand, in the services sector, the main contributor has been capital input except for in the 1980s.

The analysis in the present paper shows that there is substantial scope for the private sector to invest and lead the economic recovery of Pakistan. In agriculture, for example, there is a need to do away with the government's purchase of the output and setting the prices. Also, the agriculture supply chain can benefit from the presence of the private sector, which encourages competition and ultimately benefits both producers and consumers. In Pakistan's agriculture sector, seeds used are of low quality but the import and the use of imported hybrid seeds, which have significantly higher yields, is not allowed.

Pakistan's economy is also held back by overregulation and the presence of the public sector in the economy. Evidence shows that the government's footprint on Pakistan's economy is as high as 67 percent (Haque & Ullah, 2020). Similarly, excessive requirements of licences and NOCs, also affect investment negatively (Haque & Qasim, 2022). For example, in the housing sector and the construction industry, there is excess demand, but the private sector is held back by overregulation in the form of zoning laws.

Evidence points towards the positive effects of participation of the private sector and deregulation on GDP and TFP growth (Kim & Loayza, 2019), necessitating the opening up of the economy in Pakistan. The decade-wise trends in the TFP growth and GDP growth clearly show that liberalisation episodes in Pakistan's economy have resulted in higher TFP growth leading the GDP growth. Moreover, political stability, which perhaps leads to macroeconomic stability, is also associated with better economic performance in

Pakistan. In this regard, a World Bank study notes, "not only political stability" but high levels of external aid and ability to push through reforms appear associated with growth spurts" (World Bank 2010). However, in Pakistan, the reform efforts to deregulate and liberalise the economy have been sporadic to have any meaningful impact on long-run economic growth.

In the 1980s, as discussed above, the participation of the private sector was encouraged along with greater import liberalisation. On the contrary, in the 1990s despite the introduction of major economic reforms, the economy went into a lull. The main reasons identified for low economic growth are political instability, macroeconomic instability, and an unstable policy environment in terms of rules, taxes, and import tariffs. Particularly, the arbitrary use of SROs distorted the level playing field.

The 2000s saw improvements, albeit mild ones, in stabilisation policies and, most importantly, in structural reforms. There were improvements in trade openness and financial depth. The growth in the 2000s took place due to better macroeconomic fundamentals, structural reforms, institutions, governance, and private sector dynamism (Muslehuddin, 2007). Certain structural reforms, i.e., financial sector restructuring, privatisation, liberalisation and deregulation of the economy and bank reforms leading towards a market-led economy were undertaken. The privatisation process was pursued; the focus was on banking, telecommunication, oil and gas and the energy sector.

APPENDIX

The net capital stock at the beginning of period *t* can be written as a function of net capital stock at the beginning of period $t-1$, K_{t-1}, investment in the previous period I_{t-1}, and consumption of fixed capital stock, D_{t-1}. Hence:

$$K_t = K_{t-1} + I_{t-1} + D_{t-1} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(A1)}$$

Assuming that capital stock depreciates at the rate δ, the capital stock can be written as:

$$K_t = (1-\delta)K_{t-1} + I_{t-1} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(A2)}$$

Iteration of this equation backwards up to the initial period leads to the following equation:

$$K_t = \sum_{i=0}^{\infty}(1-\delta)^i I_{t-(i+1)} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(A3)}$$

PIM requires an estimate of initial capital stock to arrive at a series of capital stock for subsequent years. One way is to guess the initial value and then estimate capital stock for later years, using data on GFCF. However, it is highly arbitrary. Another method reported in the literature to obtain the initial capital stock is to use the following equation:

$$K_{t-1} \approx \frac{I_t}{g_I+\delta} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(A4)}$$

where $K_{t-1}$is initial capital stock, in period $t-1$, I_t is GFCF in period t, g_I is the growth rate of GFCF for the entire period for which the capital stock period is to be estimated, and δ is the capital stock depreciation rate. The rationale behind using the above equation to

estimate initial capital stock is that capital stock and investment grow at roughly the same rate and the growth rate of investment can be used to approximate initial capital stock. Following Berlemann and Weselhöft (ibid.), we regress GFCF on time to derive initial investment for the period t, using data from t_2 to T. Specifically, the following equation is used to estimate initial investment, using the OLS method:

$$lnGFCF_t = \alpha + \beta \cdot Time + \varepsilon_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(A5)}$$

Next, using the estimated parameters, α and β from Equation 3, the fitted value of the investment for period t is calculated using the following equation:

$$ln\widehat{GFCF}_{t1} = \alpha + \beta \cdot Time_1 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(A6)}$$

This gives a series of investment, ranging from t to T, using the exponential function. the first value of the fitted investment for t to calculate initial capital stock, using Equation A6. Instead of calculating the growth rate of investment, g_I, calculated from the data, β as a measure of trend investment growth is used. The capital stock for subsequent years is then calculated using Equation A2 above.

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