

Pakistan's Productivity Performance and TFP Trends, 1980–2015: Cause for Real Concern

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Abstract

This paper reviews Pakistan's productivity performance over the last 35 years (1980–2015) and identifies factors that help explain the declining trend in labor productivity and total factor productivity (TFP), both of which could have served as major drivers of productivity growth – as happened in East Asia and more recently in India. A key finding is that the maximum TFP gains and their contribution to economic growth are realized during periods of high-output growth. The lack of sustained growth and low and declining levels of investment appear to be the most important causes of the low contribution of TFP to productivity growth, which has now reached levels that should be of major concern to policymakers vis-à-vis Pakistan's growth prospects.

Using the endogenous growth model, we examine the contribution of physical capital, human capital and TFP to labor productivity. The results suggest that, over these 35 years, the contribution of physical capital and education remains modest and there has been a declining trend in TFP growth. This shows that Pakistan's economy has not taken full advantage of the favorable technological developments and rapid globalization of the period. We also question the view expressed in recent studies that Pakistan's growth has been driven primarily by factor inputs, namely labor and capital, and not by TFP growth. The paper argues to the contrary that it is the lack of investment in and growth of the stock of capital embodying the most recent knowledge and technology that has inhibited TFP growth post-1990. Finally, there is an urgent need for further research to understand the dynamics of growth in services and to raise TFP in this sector as India has done post-1990.

Keywords: Growth, labour, capital, labour productivity, total factor productivity, Pakistan.

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1. Introduction

Since the 1980s, and until recently, rapid globalization – driven in part by the unprecedented pace of technological change, especially in information and communications technology (ICT) – has allowed several developing countries, including China and India, to take advantage of these developments and achieve exceptionally high rates of economic growth, even soaring to double digits. Unfortunately, Pakistan, which was among the ten fastest-growing economies of the world during 1960–90, has not been one of them.¹ This is despite the fact that, in many ways, Pakistan was a more open and globalized economy than either China or India in the early 1980s. While Pakistan’s low and declining economic growth during 1990–2015 (except for a brief spurt in 2003–06) has been the subject of considerable rumination, an important factor responsible for this outcome, i.e., labor productivity, has not received the attention it deserves.

The importance of labor productivity is best captured by Nobel Laureate Paul Krugman: “Productivity isn’t everything, but in the long run it is almost everything. A country’s ability to improve its standard of living over time depends almost entirely on its ability to raise output per worker” (1994). A closer examination of Pakistan’s labor productivity trends is both revealing and deeply worrying. Compared to the 1980s, when labor productivity (defined as GDP divided by the employed labor force) grew at 4.2 percent per annum, by the 1990s this had plummeted to 1.8 percent, falling further to 1.3 percent during 2000–15. Since 2007, it has grown at just 1 percent. In India, the trend has moved in the opposite direction, with labor productivity growing to well over 5 percent during 2000–10.

Labor productivity, or output growth per worker, can be attributed to three major factors (ignoring arable land, which did not grow in this period): (i) increases in physical capital (machinery and related inputs), (ii) increases in human capital (measured by average years of schooling) and (iii) what economists term ‘total factor productivity’ (TFP), which measures the contribution of technological progress and more efficient use of existing resources.

While the contribution of both capital and labor has been marginal – for good reason, as we explain below – it is the continuing decline in TFP growth over the last 25 years that exposes many of the fundamental

¹ Based on various issues of the World Development Report (World Bank).

weaknesses that bedevil the Pakistani economy. It is indeed ironic that, despite many attempts at economic reforms under the aegis of the International Monetary Fund (IMF) and World Bank, TFP growth has slowed down drastically, pointing to the little impact these reforms have had on improving economic efficiency when they were expected to have exactly the opposite effect. Clearly, the reform process – either due to its uneven pace or frequent reversals – has not delivered. This declining TFP growth also shows that, despite the widespread use of mobile phones and other ICT-driven gadgets, Pakistan has been unable to take advantage of the potential of extraordinary technological advancements we have seen in the last 25 years. Accordingly, we focus on the following questions:

- Why did the overall economy as well as its main sectors (agriculture, industry and services) not become more productive and efficient (in terms of a rising TFP growth) during 1980–2015 – a period of rapid globalization and technological change (especially in ICT), in which far-reaching reforms were undertaken under the aegis of the IMF and World Bank post-1990?
- What were the major contributors to the overall declining trend in productivity growth? Physical capital per worker, human capital (educational attainment) or TFP, which is expected to capture technological change, innovation and improvements in the basic efficiency of resource use?

To address these questions, we use the endogenous growth model and analyze the contribution of physical capital, human capital and TFP to overall labor productivity as well as that of the major sectors. Our main conclusion is that the maximum TFP gains and their contribution to growth are realized during high-output growth. This is because new investment (which drives growth) embodies the latest knowledge, innovation and technology, in turn raising TFP growth and its contribution to productivity and economic growth. The lack of output growth post-1990, except for a brief spurt in 2002–06, was a key factor holding back the favorable impact of the economic reforms undertaken as they coincided with downturns in economic growth. These downturns were as much a result of deflationary policies adopted to restore macroeconomic stability as the slowdown in the global economy after the financial crisis of 2008.

The study analyses separately the sources of economic growth in the three main sectors – agriculture, industry and services – and finds significant differences in factors, including the contribution of TFP to economic growth as well as in the dynamics of output, productivity and

the TFP growth of each sector. Indeed, a sectoral approach is key to understanding and interpreting results at the aggregate level.

2. A Review of the Literature

A number of empirical studies have been conducted on developed and developing economies to explain how growth in output can be attributed to growth in factor accumulation and increasing factor productivity.

In an important study, Haque (1995) analyzes the behavior of labor productivity growth in manufacturing – taken to represent a country’s competitive strength – across a sample of developing countries² for the two subperiods 1970–79 and 1980–89 (as pooled observations). He regresses it on output growth in recognition of Kaldor’s (1967) test of Verdoorn’s Law, which postulates a close relationship between the two due to increasing returns to scale as well as technological progress. Although the results are not as strong as Kaldor had found for industrialized countries for the 1960s, Haque’s results confirm a positive relationship between the growth of manufacturing output and productivity growth.

Haque (1995) then regresses the residual between the observed and estimated values from the earlier regression on primary school enrollment and the investment rate. While he does not find a significant relationship with the former (possibly due to the small variation between countries), he does find a significant relationship with secondary school enrollment which, as he argues, is more relevant to the manufacturing sector. The investment rate is also a significant variable in explaining differences in labor productivity, although because of some collinearity between the secondary school enrollment and investment rates when used together, Haque’s results show that the explanatory power of the regression does not significantly improve.

In a carefully crafted study, but using somewhat shaky data sources and measures of key variables, Mahmood and Siddiqui (2000) analyze the reasons for the “sluggish” growth of large-scale manufacturing during 1972–97 after the sector had grown rapidly in the preceding 20 years (1947–72), albeit starting from a small base. They work with the proposition that the main cause of this slowdown was the decline in TFP growth, which

² Argentina, Chile, Colombia, India, Korea, Malaysia, Mexico, Pakistan, Singapore, Thailand and Turkey.

they feel best captures the sector's state of competitiveness as well as an "ailing science and technology apparatus."

They test this hypothesis with TFP as the dependent variable against (i) knowledge capital (drawing on expenditure on research and development derived from the Planning Commission and Pakistan Council of Scientific Research, (ii) human capital (enrollment in professional colleges and vocational and technical education), (iii) technology transfers (foreign patents registered in Pakistan), (iv) (trade) openness (the trade-to-output ratio and export growth rate) and (v) policy changes to represent law and order and liberalized policies (using a dummy for the period of nationalization, 1971–77). While their results show a significant relationship between TFP and these variables, given that a number of these factors are already accounted for in the calculation of TFP, it is difficult to interpret the results as showing causality between the two.

The downturn in Pakistan's economy in the 1990s focused attention on the factors responsible for and the behavior and role of TFP growth in this process. It also marked a shift of emphasis to the overall economy as well as its major sectors rather than the earlier emphasis on manufacturing. Pasha, Ghaus-Pasha and Hyder (2002) cover the period 1972/73 to 1997/98, divided by the Five-Year Plan periods, but concentrate on the slowdown in TFP growth in the 1990s. They find a clear relationship between TFP and the growth of the economy, stating that the "economy grows fast when TFP has risen rapidly." For the overall period, they find that TFP growth was responsible for over 40 percent of the growth of the economy. Their sectoral analysis of TFP during 1992/93 to 1997/98 reveals wide variations in the performance of TFP within different sectors. While Pasha et al. provide the first study that highlights the importance of the services sector in slowing down overall TFP growth as well as leading to overall economic growth, they do not offer any convincing answers to explain the poor performance of the services sector.

In analyzing the determinants of TFP – both overall and for the major sectors – by regressing it (as the dependent variable) on a number of variables such as investment and human capital, Pasha et al. (2002) make the same mistake mentioned earlier. TFP is calculated *after* accounting for the contribution of variables such as capital (investment) or some variables are already taken into account (such as human capital) when calculating TFP: this renders the results spurious rather than establishing a relationship between the variables and TFP.

Khan (2006) concentrates on the macroeconomic determinants of TFP in Pakistan for different periods, covering the 1960s, 1970s, 1980s, 1990s and then 2001–03. Analyzing trends in TFP growth and its relationship with economic growth, he finds an even stronger association than Pasha et al. (2002), stating that “GDP growth and TFP growth follow *identical* behavior throughout the period of observation” (p. 351, emphasis added). He does not, however, pursue this finding further. Khan’s regression analysis in identifying factors that affect TFP growth is not seriously thought through and suffers from the same drawbacks mentioned with reference to the earlier two studies.

Chaudhry (2009) calculates the TFP growth for Pakistan for the period 1985–2005. This is done separately for large-scale manufacturing (drawing on data from the Census of Manufacturing Industries), agriculture (using the Agricultural Statistics of Pakistan) and for the overall economy. In terms of its contribution to agricultural growth, his results show that TFP contributed 49 percent, labor 40 percent and the growth of other factors 11 percent. In contrast to agriculture, TFP contributed only 29 percent, labor 15 percent and capital stock an impressive 56 percent to large-scale manufacturing. For the economy as a whole, TFP grew by 1.1 percent a year with three quarters of this growth attributed to labor and capital stock. These sectoral estimates put Pakistan at par with, or above the average for, other developing countries, but lagging far behind the East Asian economies. Chaudhry therefore concludes that Pakistan witnessed input-driven rather than productivity-driven growth.

López-Cálix, Srinivasan and Waheed (2012) analyze the continuing steady fall in productivity growth (measured by TFP) that started in the 1990s and continued till 2010. They calculate and then interpret the contribution of capital, land, human capital (years of schooling) and TFP to labor productivity growth for three decades, 1980 to 2010, for the overall economy and the major sectors (agriculture, industry and services). Their main conclusion is that growth in output in Pakistan was driven mostly by increases in factor inputs, mainly labor and capital, rather than by increases in TFP.

They argue that the decline in TFP growth in the 1990s – a period of trade liberalization and other economic reforms – was not caused by trade liberalization, 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 argue that the spurt in economic growth from 2002/03 to 2005/06 did not result in the structural

transformation of the economy and that TFP's contribution declined significantly in 2000–10. They conclude that, unless Pakistan's record in structural reforms improves, TFP will not improve and that "reform is fragmented and littered with a myriad of policy reversals."

The selected studies agree on the broad trend of a decline in the growth rates of labor productivity and TFP starting in the 1990s, but offer a wide range of interpretations, which we examine subsequently. These include the view that output growth in Pakistan has been driven by rising factor inputs and not TFP, and that the lack of consistent policies in implementing reforms explains why the economic reforms undertaken under IMF tutelage had such little impact. We are critical of the use of regressions to test the impact of different variables on TFP without thinking through why one would expect such a relationship to exist, especially since in many cases TFP either includes in its measure some of these variables or is calculated as a residual after accounting for the contribution of other variables. This has resulted in a number of spurious regressions and conclusions.

3. Growth Accounting

Despite the limitations of its assumptions,³ the growth accounting framework pioneered by Solow (1956) is widely used to measure the contribution of factor inputs (mainly labor and physical capital) to economic growth and the residual (i.e., what cannot be explained by these factors) as measuring the rate of technological progress. Rather than viewing technological progress as an exogenous factor, as given in the original neoclassical growth model, Romer (1986) and the protagonists of the "new growth theory" view it as an endogenous variable resulting primarily from the contribution of human capital to economic growth.⁴ This view is now incorporated in the recent growth accounting models.

3.1 *Developing a Growth Model*

In the original model, the basic neoclassical production function is:

$$Y = F(A, K, L)$$

³ For a detailed discussion on the extreme restrictions of these assumptions, especially those underlying the concept and calculation of TFP, see Haque (1995).

⁴ As Romer (1990) states: "The most interesting positive implication of the model is that an economy with a larger stock of human capital will experience faster growth."

where Y is real output, K is capital stock, L is the size of the employed labor force and A is the residual term (TFP). This implies that growth in output comprises growth in factor inputs and TFP:

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

where g^Y denotes the growth rate of output g^L denotes the growth rate of labour, g^{TFP} denotes the growth rate of total factor productivity, α is the share of labor in output and $(1-\alpha)$ is the share of capital in output.

As output and inputs are observed, then:

$$g^{TFP} = g^Y - \alpha g^L - (1 - \alpha)g^K$$

The concept of TFP growth essentially incorporates technical change and improvements in economic efficiency in the use of factor inputs. The former involves adopting new technologies while the latter focuses on increasing the efficiency with which the available resources and factor inputs are used. Bosworth and Collins (2008) broaden the interpretation of TFP: according to them, it not only measures technical efficiency, but can also be attributed to several sociopolitical and economic factors such as government policy or weather shocks that determine the efficiency of factor use. Moreover, they highlight the fact that this measure presents the “proximate causes” of economic growth and, hence, provides a benchmark for analyzing economic performance.

Over the years, the research on productivity growth has evolved as researchers attempt different methodologies ranging from growth accounting to rigorous regression techniques. For this particular study, we utilize the growth accounting framework and assume a Cobb–Douglas production function with fixed factor shares, i.e., constant returns to scale and technical progress is assumed to be Hicks-neutral.⁵ We also add to the earlier model human capital as an independent variable (Romer, 1990). Given the importance of agriculture for developing countries such as Pakistan, we add arable land to the factor inputs. Our model is, therefore, represented as:

$$Y = AK^\alpha R^\beta (LH)^{(1-\alpha-\beta)}$$

⁵ This means that, for a rise in output due to technical change, the contribution of inputs is equally divided, thus leaving the marginal factor productivities unchanged.

where Y , A , K , R and LH are real GDP, TFP, physical capital, arable land and human-capital-adjusted labor input, respectively. The latter is formulated by the interaction of L , which is the employed labor force, and H , which is human capital. This input captures increases in labor productivity as a result of educational attainment and is calculated by using the mean years of schooling and assuming that an additional year of education raises the level of productivity by a certain percentage – usually between 5 and 10 percent as per the empirical evidence (Bosworth & Collins, 2008). We assume that an additional year of education raises labor productivity by 7 percent, as done also by López-Cálix et al. (2012).

Following López-Cálix et al. (2012), our results are reported in terms of output per worker. This is done by dividing the entire production function by labor input (L) and taking logarithms on both sides of the function. The growth in real GDP per worker (Y/L) is further decomposed into the contributions of growth in physical capital per worker (K/L), growth in arable land per worker (R/L), increases in education per worker (H) and growth in TFP (A):

$$\Delta \ln \left(\frac{Y}{L} \right) = \alpha \left[\Delta \ln \left(\frac{K}{L} \right) \right] + \beta \left[\Delta \ln \left(\frac{R}{L} \right) \right] + (1 - \alpha - \beta) [\Delta \ln(H)] + \Delta \ln(A)$$

Drawing on this equation or identity, output growth comprises the weighted growth in labor (employment) and labor productivity. The latter is the weighted sum of the growth in the productivity of physical capital, human capital, arable land and TFP. The contribution of each of these four variables to the growth of output is simply their value as a share of output growth.

The following factor shares are assumed:

Factor shares in	Agriculture	Industry	Services
Physical capital (K) α	0.25	0.55	0.20
Arable land (R) β	0.50	0.00	0.00
Human capital (LH) $1 - \alpha - \beta$	0.25	0.45	0.80

3.2 Data Limitations

It is important to keep in mind that the data for some of the key variables used in this study, especially labor and capital, can be termed robust at best rather than accurate or precise, and the results must also be interpreted accordingly. In the case of labor, the bulk of the labor force is still employed in agriculture (suffering from different degrees of

underemployment) and almost two thirds of the urban labor force is employed in the informal economy.

In such a situation, it is difficult in many cases – except for those in formal sector employment – to differentiate between employment growth resulting from an increase in demand for labor and employment growth that merely reflects the pressure of an increase in supply, keeping in mind the absence of any available unemployment insurance or effective safety net. This means that all those entering the labor force or those of working age must work for a living with whatever meager earnings or hazardous working conditions this may entail. The absence of data on hours of work or the working poor further complicates the measurement of the employed labor force. In this study, the data for the employed labor force has been taken from various issues of the Labor Force Survey.

The challenges in measuring the stock of capital and its rate of increase in real terms also pose considerable problems, as a large part of this investment may not be recorded and captured in the national income accounts. We have estimated it using the perpetual inventory method by applying an annual depreciation rate of 5 percent to the existing capital stock and adding incremental investment. As a result of data limitations and assumptions in the growth accounting model in which the marginal productivity of labor remains unchanged, the contribution of labor to output growth may be exaggerated as well as the contribution of physical capital underestimated.

4. Pakistan's Growth Accounts: Trends in Labor Productivity and TFP

This section provides an in-depth assessment of Pakistan's productivity performance for the whole economy and for the major sectors (agriculture, industry and services).

4.1 Aggregate Growth

Pakistan's growth path during 1980–2015 has continued to follow a cyclical pattern, with periods of high growth followed by periods of low and stagnant growth ("boom and bust") as in the 1950s (low growth), 1960s (high growth) and 1970s (low growth). For the post-2000 period, rather than take separately the period 2000–10, we have broken down 2000–15 into two subperiods – 2000–07 (high growth) and 2008–15 (low growth) – so as to bring out the sharp differences in growth performance between the two. This division, as we discover in our analysis, has a clear advantage over López-Cálix et al. (2012) who look at the period 2000–10 together.

Pakistan's economic performance during the last 35 years (1980–2015), with an average economic growth rate of around 5 percent, can at best be termed anemic, with spurts of high growth that could not be sustained, followed by periods of low growth or economic stagnation. The results in Table 1 reflect the declining growth of output for the economy as well as the declining value of TFP over the years.

Table 1: Sources of economic growth overall, 1980–2015

Fiscal years	Growth in			Investment as % of GDP	Output per worker % contribution of			
	Y	L	Y/L		K	LH	R	TFP
1980-90	6.0	1.8	4.2	24.5	1.0	0.9	-0.2	2.4
1990-2000	4.4	2.6	1.8	21.9	0.5	-0.2	-0.3	1.8
2000-15	4.3	2.9	1.3	16.5	0.0	0.5	-0.2	1.1
2000-07	5.3	3.7	1.5	17.9	-0.1	0.4	-0.3	1.6
2008-15	3.2	2.1	1.0	15.0	0.0	0.6	-0.1	0.6
1980-2015	4.8	2.5	2.3	20.3	0.4	0.4	-0.2	1.7

Note: Y = real output, L = employment, Y/L = output per worker, K = physical capital, LH = human capital, R = arable land, TFP = total factor productivity.

Source: Authors' calculations.

Based on the growth accounting framework, these results show that, for the overall economy during 1980–2015, the TFP growth rate was 1.7 percent, which contributed 35 percent to the average economic growth rate of 4.8 percent (Table 1). The main contribution to output growth (52 percent) in this period was from increasing labor inputs (i.e., growth of employment). The contribution of physical and human capital at just over 8 percent for each is a clear reflection of the low and declining investment levels in this period and the continuing neglect of education in terms of resources allocated and the quality of education imparted. The negative contribution of arable land indicates water scarcity and insufficient investment in building water reservoirs.

Our results are reasonably similar to those of earlier studies. For a slightly shorter period (1980–2010), López-Cálix et al. (2012) estimate a TFP growth rate of 1.4 percent per annum, which contributed 28 percent to the average economic growth rate of 5 percent in this period. Labor contributed 54 percent, which is very similar to our result. The contribution of physical capital, on the other hand, in their study is much higher at 28 percent compared to our results, but the contribution of human capital at 8

percent is the same. The contribution of arable land is also negative by a small amount in both studies.

Chaudhry (2009) estimates the growth of TFP at 1.1 percent for the period 1985–2005, which contributes 27 percent to the average growth rate of 4.1 percent for this period. The respective contributions of labor and capital to output growth are 40 and 30 percent.

Pasha et al. (2002) cover the period 1972/73 to 1997/98 and find that TFP grew by 2.2 percent per annum, contributing 40 percent to the average output growth rate of 5.5 percent. While they do not separate the contribution of labor and capital to output growth, instead taking factor inputs as a whole, they do assess the growth of labor separately. Based on this estimate, it is possible to derive the contributions of labor and capital to output growth, which work out to 44 and 16 percent, respectively.

To summarize our results and those of the major studies cited:

- The rate of growth of TFP in our study as well as in López-Cálix et al. (2012) and Pasha et al. (2002) declines over time after the 1980s as does as the growth rate of output.
- The average contribution of TFP to growth⁶ for the somewhat different time periods covered by these studies over 1972–2015 varies between around 30 and 40 percent. While this may be higher than the average for developing countries, it is significantly lower when compared with the original four “East Asian tigers” where, over 1975–1990, the contribution of TFP was 50–60 percent. This, in turn, pushed output growth to almost double the growth rate Pakistan achieved in the years we cover (see Sarel, 1996, on the performance of the East Asian economies).
- The more significant contribution to growth in output in Pakistan has stemmed from the growth of employment or labor inputs, ranging in different studies from 40 to 55 percent.
- The contribution of human capital is minimal at less than 10 percent in the two studies that calculate its contribution.
- The contribution of capital shows wide variations (between 8 and 30 percent) in the different studies. While this may reflect partly the

⁶ Since our results and those of López-Cálix et al. (2012) show separately the (low) contribution of human capital to output growth, adding it to TFP growth would bring it closer to Pasha et al. (2002), who exclude it from their calculation of TFP.

difficulties of measuring capital, it also reflects the declining level of investment over the period, especially post-2000 when it fell to very low levels, hovering just around or slightly over 15 percent.

In evaluating the performance of TFP growth for Pakistan between 1970 and 2015, one needs to pay special attention to two important factors – low and declining investment levels and the high growth of the labor force at 2.8–3.2 percent in this period. In the case of the latter, the implied employment elasticity of growth (employment growth divided by output growth) for the period 1980–2015 is 0.52. This implies that there is a tradeoff between productive labor absorption and increases in labor productivity, given the very high growth of the labor supply. The challenge here is to find a growth path in which both labor absorption and labor productivity can be increased at the same time, as happened in Japan in the 1920s (Ishikawa, 1981) and during the “green revolution” in Pakistan in the latter half of the 1960s.

Turning to the decline in investment levels from low to extremely low post-2008, not only is this reflected in the low contribution of physical capital to productivity growth, but also in the relatively low and declining TFP growth over the period. The reason is that new investment embodies the latest cutting-edge technology and knowledge, which spurs both productivity and TFP growth. There is also a clear link between the growth of demand or increasing output and new investment to meet this demand. As Haque (1995) shows, there is a clear and reasonably strong relationship between output growth and productivity and between productivity growth and investment.

This version of what is now known as Kaldor–Verdoorn’s Law also emerges from our results in Table 1, especially when we compare the 1980s with 2008–15, but also if we look at trends over the period and the results for the entire period 1980–2015. During the 1980s, physical capital contributed around 17 percent, human capital 15 percent and TFP 40 percent to an average output growth rate of 6 percent. The virtuous circle between rising demand or output growth drawing in new investment embodying the latest technology and raising TFP – which in turn pushes up labor productivity – emerges clearly during these years. It is also important to note that, during periods of high growth, human capital contributes significantly to output growth, which it does not do for much of the later period of low growth, implying that returns on human capital (measured by years of schooling) are best realized in a growing economy rather than one mired in low growth or stagnation.

What light do our results shed on increased efficiency driven by economic reforms pushing up TFP growth and this, in turn, pushing up overall labor productivity and shifting the economy onto a higher growth path? Given that, post-1989, for more than half the period up to 2015 the economy was under different IMF programs and many economic reforms were initiated, the results have been extremely disappointing. This is seen most clearly in the continuing decline in TFP growth starting in the 1990s when, compared to the 1980s, it declined by 25 percent and by almost 55 percent during 2000–15.

Why did this happen? To answer this question, we believe it is better to look at the more detailed sectoral findings and then build on these for plausible explanations. Such an approach is also now favored for studies investigating productivity trends in advanced economies (see, for instance, Dabla-Norris et al., 2015).

4.2 Agriculture

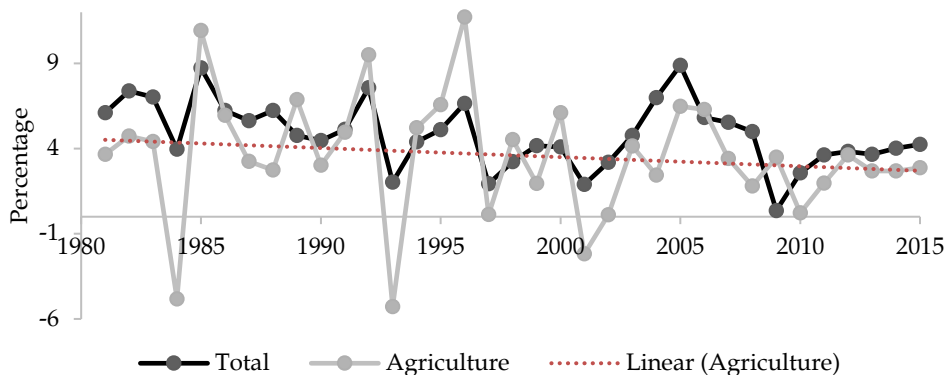
It may be a surprise to many, but Pakistan's economic performance still relies heavily on the performance of its agricultural economy (Ali, 2004). This is despite the fact that the share of agriculture in GDP has gradually fallen over the years and its share on average over the study period was around 25 percent.⁷ However, almost half the country's labor force (around 45 percent) is still employed in this sector.

An important change that characterizes this period is the rising share of the livestock sector (including milk and related products), which now contributes almost 60 percent of the value added in agriculture, the remainder comprising the crop sector (near 40 percent) and forestry and fisheries (around 4 percent). The rural areas still provide livelihoods to over 60 percent of the population and the families that live there. A large proportion (almost 60 percent) of the remittance inflows from overseas workers, which increased manifold post-2001 and accounted for over 7 percent of GDP in 2014/15, goes to rural families. Agriculture has strong direct links with mainly rural small-scale industries as well as a fast growing rural services sector. It provides a major market for domestically produced consumer durables (motorcycles) and consumer goods such as soft drinks and cosmetics.

⁷ The share of agriculture in GDP was 19.8 percent in 2015/16 and its share of the labor force was 43.7 percent (Pakistan Economic Survey 2015/16).

Figure 1 depicts the close association between the growth in total output (value added) and agricultural output (value added), even though this relationship has weakened as the share of agriculture in GDP fell from 32 percent in 1980 to 20.9 percent in 2015.

Figure 1: Growth rate of real output (total) and agricultural output



There are two important questions as regards the performance of the agriculture sector during the period we cover. The first is explaining the wide difference in output growth between 1980–2000 and 2000–15 (Table 2), when it fell by almost 40 percent. The second is the significant difference in the contribution of TFP to the high growth witnessed in the 1990s compared to the high growth of the 1980s, while the opposite holds in terms of the contribution of physical capital and human capital in the two periods, being high in the 1980s and very low in the 1990s.

Table 2: Sources of economic growth in agriculture, 1980–2015

Fiscal years	Growth in			Investment as % of GDP	Output per worker % contribution of			
	Y	L	Y/L		K	LH	R	TFP
1980-90	4.0	1.8	2.2	2.7	1.4	0.4	-0.7	1.1
1990-2000	4.4	1.8	2.6	1.9	0.4	-0.1	-0.6	3.0
2000-15	2.6	2.0	0.6	2.7	1.1	0.1	-1.0	0.5
2000-07	2.9	2.2	0.7	2.3	0.9	0.1	-1.1	0.8
2008-15	2.5	1.4	1.1	3.1	1.3	0.1	-0.4	0.1
1980-2015	3.5	1.9	1.6	2.5	1.0	0.1	-0.8	1.4

Note: Y = real output, L = employment, Y/L = output per worker, K = physical capital, LH = human capital, R = arable land, TFP = total factor productivity.

Source: Authors' calculations.

These differences in TFP contribution to output growth between the 1980s and 1990s also emerge in earlier studies. While, in our study, the contribution of TFP to agricultural output growth increases from around 30 percent in the 1980s to near 70 percent in the 1990s, Pasha et al. (2002) find that it increases from around 55 percent to near 80 percent for roughly the same periods. López-Cálix et al. (2012) show that the share of TFP growth in agricultural output growth, while not as pronounced, rises significantly from 30 percent in the 1980s to 55 percent in the 1990s. For the overall period 1990–2005, Chaudhry (2009) estimates that the agriculture sector's TFP grows at 1.75 percent, contributing to 50 percent of agricultural growth. This is fairly high, given that the years he covers include the drought years post-2000, which pushed down the average agricultural growth rate for this period to 3.6 percent.

It is not always easy to differentiate between the effects of policy reforms that result in increased use of factor inputs, spurring higher output, and technological advancements that push up the production frontier, thus raising TFP. The impact of these changes may be difficult to fully capture and assign to neatly divided timeframes. For example, a new technology may be introduced in a particular period, but its widespread use and the resulting productivity increase may occur in a subsequent period.

To a limited extent, studies of the performance of agriculture in the 1980s and 1990s provide interesting insights into the factors that pushed up output growth, although we cannot differentiate clearly between whether these were due to increased input use or TFP growth (see Ahmad, Chaudhary & Ilyas, 2008; Ali, 2004; Zaheer, 2013). According to these studies, an important reform of the 1980s was to increase significantly the share of credit available to farmers from banks (private as well as government-run or controlled) as well as giving small farmers easier access to credit. This substantially increased farmers' use of fertilizer and pesticide. Moreover, the liberalization of input distribution (which had been subject to many government controls) by encouraging private firms to distribute as well as produce these inputs made them easier to access. As part of these liberalization measures, the state-owned rice and cotton export corporations were abolished.

The 1980s also saw the introduction of new high-yield varieties of cotton, which more than doubled production from 3,280 bales in 1980 to 7,522 bales in 1990 and further to 10,000 bales in 1991, although in subsequent years production varied greatly due to pest attacks and

unfavorable weather conditions. With cotton contributing almost 10 percent to agricultural GDP (and near 30 percent to all crops), this substantial jump played an important role in accelerating output growth in the 1980s and to a more limited extent in the 1990s. The removal of subsidies in the 1990s under the IMF reform program by raising the price of inputs such as fertilizer may have led to more efficient use of these inputs. Support prices for wheat and other crops were also raised in the 1990s, which improved the terms of trade for agriculture, resulting in higher profitability and therefore encouraging increased input use.

Another important development that started in the 1980s and gained momentum in the 1990s was the growth of the livestock sector (averaging over 5 percent). The sale of milk and dairy products became easier as private firms, including large multinationals such as Nestle, set up pick-up points for milk at or near farmers' doorsteps deep in the rural countryside. The government also played an important role in stimulating the growth of the livestock sector by introducing new breeds of cattle, including from abroad, as well as support services to farmers such as the availability of veterinary doctors and medicines for livestock and poultry in rural areas.

There was a sharp subsequent downturn in agricultural growth after the 1990s. The following decade witnessed successive drought years in 2000 and 2001 from which agriculture did not fully recover till 2007. Post-2008, a number of factors slowed down agricultural growth, including persistently hostile weather conditions, a sharp increase in energy prices that fueled large increases in fertilizer prices, subsequent power cuts that affected tubewell use and water availability, and the lack of public investment in developing new seed varieties. These counteracted the large increase in support prices for wheat in 2008, which had led initially to large increases in wheat production.

The sharp decline in TFP growth and low growth of output and labor productivity post-2000 reflect these unfortunate developments. Yet there are important lessons to be drawn from this overall period. The first is that the decline in TFP in agriculture post-2000 cannot be blamed solely on weather conditions, the unprecedented rise in oil prices in 2007 and crippling energy shortages post-2008. It was as much a failure to maintain the growth momentum generated in agriculture in the 1980s and 1990s when Pakistan witnessed a mini-green revolution due to new seed varieties in cotton and tremendous growth in livestock and dairy products.

Policymakers are much to blame for the cotton seed fiasco that resulted from the lack of a clear-cut policy on the development and distribution of BT cotton seed, introduced in 2002. This led to illegal imports of the seed from India and the resulting mix made the cotton crop vulnerable to persistent pest attacks. This is not only true for BT cotton, but also for other major crops, vegetables and fruits, as agricultural research institutions in Pakistan have shown little progress in producing new varieties of high-yield, pest-resistant seeds. This is unfortunate, given the substantial resources the government and donors have allocated to maintaining these institutions and funding their research. The same can be said for livestock, dairy and milk products, where the government has adopted inconsistent policies, an example of which was to favor the import of powdered milk at the expense of local dairy farmers in the livestock sector.⁸

We can now draw some conclusions from our results as well as the factors identified as having influenced output growth during 1980–2015:

- If the 1990s has been labeled a ‘lost decade’ for Pakistan’s economy in terms of its poor growth, productivity and TFP performance, this was certainly not true of the agriculture sector, which showed high and robust growth in both the 1980s and 1990s.
- The subsequent near collapse of this sector in 2000–15, which our results clearly reflect, cannot be blamed solely on weather conditions and the increase in oil prices. It was as much due to inconsistent and, at times, unfavorable policies, including the lack of serious attention to developing pest-resistant, high-yield seed varieties.
- While it is difficult to clearly interpret our results on the extremely low contribution of physical and human capital to output growth in agriculture after the 1980s, in the case of human capital these values appear to reflect the poor quality – low education and skill levels – of the rural labor force, despite claims that rural education indicators had improved.

⁸ “Speaking on a calling attention notice in the National Assembly the federal commerce and food security ministers agreed on the need for effectively curbing imports of skimmed powdered milk and whey powder to protect the interest of local dairy farmer” (*Dawn*, 23 May 2016, <http://www.dawn.com/news/1260019>).

- Our results indicate that the economic reforms carried out in this sector helped increase the availability and efficient use of factor inputs, especially fertilizer and credit, in the 1980s and 1990s.⁹
- The major reason we can find for the sharp rise in TFP in the 1990s is the more efficient use of inputs as a result of the removal of subsidies. It is more difficult to explain the low contribution of TFP in the 1980s, given that cotton production more than doubled due to new high-yield seeds, unless we suggest that the larger availability and use of inputs pushed down the contribution of TFP very significantly.
- Our results for the 1980s and 1990s tend to show that growth in agriculture is much more supply-driven than demand-led and that the relationship between growth of output, productivity and investment (Kaldor–Verdoorn's Law) found in manufacturing may not be applicable to agriculture.
- The rapid growth of the livestock sector and its increasing share of agricultural output (near 60 percent) means that far more policy attention should be diverted to this sector to encourage its growth in the domestic and export sectors as well as through direct support services for livestock and dairy farmers.
- The persistently negative contribution of arable land to agricultural growth in our results is a stark reminder of the low supplies of water and the need to develop new reservoirs to overcome existing shortages and meet future demand in the face of climate change and environmental concerns.
- There is a strong case for concentrating national research efforts and the limited available resources in agricultural research, where there is considerable scope for indigenous technological development, such as new seed varieties or high-yield breeds of cattle. Pakistan also needs to critically review the poor performance of its agricultural research institutions thus far, which is clearly a factor in the drastic slowdown in agricultural growth over the last 15 years.

⁹ Sabir and Ahmed (2003) also find that the removal of subsidies on fertilizer in the 1990s led to more efficient use of the input and this was reflected in an increase in TFP in the 1990s.

4.3 Industry

Manufacturing dominates the industry sector, contributing almost two thirds of industrial output.¹⁰ It is considered the most dynamic component of not just this sector, but also the overall economy, given its inherent capacity to generate and absorb technical change and reap the gains of increasing economies of scale in large-scale production. Indeed, Chaudhry (2009) expresses concern that this view can lead to the neglect of the agriculture sector, which is seen as less susceptible to both these characteristics, and to development policies and expenditures geared to encouraging industrial growth at the expense of agriculture. To what extent have these expectations been realized in Pakistan after a period of rapid industrialization during the 1950s and 1960s?

Unfortunately, the performance of industry during 1980–2015 has (barring the 1980s) been disappointing, with its share of GDP increasing only marginally from 16.4 percent in 1980 to 20.4 percent in 2015. Similarly, its capacity to generate new jobs has been extremely limited: the sector's share of the total employed labor force increased from just 20.1 percent in 1980 to 22.6 percent in 2015.¹¹

For the 1980s, the high growth rate of almost 8 percent in industry (Table 3) is accounted for by a relatively high TFP growth that contributes nearly 40 percent to output growth and 55 percent to productivity growth during this period. Investment levels were reasonably high in the 1980s and this is reflected in the significant contribution of physical capital (around 24 percent) to economic growth. The contribution of human capital remains marginal at near 10 percent and low, even negative, in subsequent periods. The contribution of labor is significantly lower than for the overall economy and other sectors at around 25 percent. The 1980s present therefore clear evidence of Kaldor–Verdoorn's Law of high growth resulting from high investment and this in turn driving both high TFP and productivity growth.

¹⁰ The other components of industry and their relative shares in 2015/16 are: mining and quarrying (12.2 percent), construction (12.2 percent) and electricity generation and distribution and gas distribution (12.2 percent). Manufacturing contributes 65 percent to industrial output, of which large-scale manufacturing accounts for almost 80 percent (Pakistan Economic Survey for 2015/16).

¹¹ For an analysis of the disappointing inability of the manufacturing sector to create productive, remunerative and decent jobs in Pakistan, see Amjad and Yusuf (2014).

Table 3: Sources of economic growth in industry, 1980–2015

Fiscal years	Growth in				Output per worker % contribution of			
	Y	L	Y/L	Investment as % of GDP	K	LH	R	TFP
1980-90	7.7	2.0	5.6	8.7	1.8	0.7	3.0	1.1
1990-2000	4.2	1.3	2.9	9.2	2.1	-0.1	0.9	3.0
2000-15	4.8	4.5	0.3	4.6	-2.1	0.4	2.1	0.5
2000-07	7.2	6.0	1.1	6.2	-2.2	0.3	3.1	0.8
2008-15	1.9	3.9	-1.8	3.0	-2.4	0.4	0.2	0.1
1980-2015	5.5	2.9	2.5	7.0	0.2	0.3	2.0	1.4

Note: Y = real output, L = employment, Y/L = output per worker, K = physical capital, LH = human capital, R = arable land, TFP = total factor productivity.

Source: Authors' calculations.

In sharp contrast, the 1990s saw a severe downturn in industrial growth and a fall of nearly two thirds in TFP growth, although the investment rate remains high – even slightly higher than in the 1980s. Interestingly, the contribution of labor to output growth is still low at only 30 percent while the contribution of physical capital doubles to 50 percent. Surprisingly, the contribution of human capital is negative.

The upturn that followed in 2000–07 saw the economy reach the industrial growth levels of the 1980s, but the dynamics of this growth revival remain difficult to explain: investment levels picked up and TFP growth shot up to levels slightly higher than the boom in the 1980s, but almost two thirds of industrial growth in this period resulted from the growth of the employed labor force. The contribution of physical capital falls to negative levels and the contribution of human capital, though positive, remains low. Clearly, there are data issues here, but what does emerge is the strong, positive relationship between high output growth and TFP growth.

The recent downturn that started in 2008 continued till the end of the period and is more easily explainable by low output growth, low investment levels, low productivity growth and very low TFP growth. The contribution of physical capital is negative, but human capital appears to play some part in the low growth that does materialize.

Among other studies on this sector, Chaudhry (2009) covers the period 1985–2005 for large-scale manufacturing and reports a TFP growth

rate of 2.4 percent, which accounts for nearly 30 percent of output growth. Pasha et al. (2002) study manufacturing (large-scale and small-scale) from 1982/83 to 1987/88 and show a very high growth rate for TFP (6.6 percent), accounting for almost 80 percent of the growth in manufacturing output (8.1 percent) in this period. López-Cálix et al. (2012) report a TFP growth rate of 3.1 percent, which explains almost 40 percent of the growth in industry for 1980–90.

The sharp contraction in growth in industry in the 1990s – and within it, for manufacturing – is clearly reflected in the results of these studies. Pasha et al. (2002) show a dramatic decline in TFP and its contribution to the growth of output in this period at around 40 percent – less than half that of the 1980s. The same is true of López-Cálix et al. (2012), who find that TFP growth falls to 0.6 percent in the 1990s, accounting for 19 percent of the far lower productivity growth rate relative to the 1980s. Interestingly, Chaudhry's (2009) results for large-scale manufacturing over 1985–2005 are very similar to our results for the 1990s in terms of TFP and its contribution to GDP (29 percent), despite the fact that he shows a much higher growth rate for large-scale manufacturing for the period he covers.

Two key questions need to be raised regarding the performance of the industry sector during this period. The first is what key factors appear to drive output growth and the high contribution of TFP to this growth. The second – and this is related to the first – is why far-reaching economic reforms failed to have any real impact on the performance of this sector for most of the period post-1990.

In answer to the first, there is a clear and strong association between periods of high output growth and TFP growth, as witnessed in the 1980s and 2000–07. The relationship between output growth and investment growth is not as clear because the high level of investment in industry in the 1990s did not spur the growth of output or TFP. This reflects low capacity use and may well explain the subsequent surge in industrial growth in 2000–07 when the utilization of this excess capacity rather than physical capital drove higher growth.

While more detailed research on this sector is required, the message that emerges from our results is that economic reforms in industry per se are not enough to increase efficiency and drive growth. The reforms failed to deliver because the accompanying economic package under the IMF programs that were implemented suppressed domestic demand and, with it, the demand for industrial goods. Unless there had been a real increase in

the demand for exports, as possibly happened in 2002–07, the reforms would fail to deliver.

While not denying the need for economic reforms that would make the industry sector more competitive in both domestic and global markets, these should be implemented in a phased manner as appears to have been done in the 1980s. The lack of a well-thought-out industrial policy under which the reforms being undertaken could be effectively implemented as well as monitored was sadly missing throughout the post-1990 period.

The key finding that emerges is that the high expectations of this sector as a major engine of growth, driven in turn by the growth of labor productivity and TFP, were not realized, except in the 1980s. Even the brief spurt in industrial growth in later years (2002–06) fizzled out. This was particularly disappointing as many countries, especially in southeast Asia, had taken advantage of the years preceding the 2008 financial crisis – of rapid globalization, an unprecedented expansion in global trade and advancement in ICT – to build up and expand industrial production through rapid growth in TFP.

4.4 Services

Over the years, as the share of services in national output and employment has increased to almost 60 and 35 percent, respectively, in 2015, it has become a primary driver of overall economic growth. During 1980–2015, the fluctuations in services sector growth were aligned with the growth of the whole economy.¹² Yet, despite the sector's growing economic importance, it has been subject to very little research, especially in terms of the forces driving growth (or lack of it) in services during the period we cover.¹³

Our results for the services sector show that, much like industry, after a period of rapid growth in the 1980s output growth slowed down, but the downturn in subsequent periods was not as pronounced, especially during 2008–15 (Table 4). Its average TFP growth over 1980–2015 was 1.5 percent and this contributed only around 25 percent to output growth over the years. Despite a relatively high investment rate compared to the other

¹² The major subsectors in services and their contribution to output in 2015/16 is as follows: wholesale and retail (30.9 percent); transport, storage and communications (22.5 percent); housing (11.35 percent); finance and insurance (5.5 percent); general government services (12.81 percent) and other services (17 percent).

¹³ For an overview of the contribution of services to the economy, see Ahmed and Ahsan (2011).

two sectors, the contribution of physical capital was less than 8 percent in the 1980s and was lower, negligible or even negative in subsequent periods. Human capital contributed more than twice this amount to output growth in services in the 1990s, but its contribution has also declined and been lower, albeit unevenly, in subsequent decades. Pasha et al. (2002) find the performance of the services sector disappointing and their results indicate the negative contribution of TFP to services in the 1980s and 1990s.

Table 4: Sources of economic growth in services, 1980–2015

Fiscal years	Growth in			Investment as % of GDP	Output per worker % contribution of		
	Y	L	Y/L		K	LH	TFP
1980-90	6.6	2.8	3.7	13.0	0.5	1.2	1.9
1990-2000	4.5	3.7	0.8	10.9	0.0	-0.3	1.0
2000-15	4.8	3.2	1.5	9.2	0.0	0.6	0.9
2000-07	5.6	4.5	1.1	9.5	-0.2	0.7	0.5
2008-15	3.9	2.1	1.8	8.9	0.2	0.2	1.4
1980-2015	5.2	3.2	1.9	10.8	0.2	0.5	1.2

Note: Y = real output, L = employment, Y/L = output per worker, K = physical capital, LH = human capital, TFP = total factor productivity.

Source: Authors' calculations.

A comparison with India is instructive, where TFP in services has been the highest among the sectors post-1990 and within it, communication services has been a major propeller of growth (Mukherjee, 2013). As Table 5 shows, over the period 1980–2004, both TFP and physical capital growth contributed significantly to the growth of services sector output – 50 and near 40 percent, respectively. While the growth of the software industry (communications) contributed greatly to this growth in India, so too did financial services and retail trade. Clearly, Pakistan has not been able to absorb and use the rapid technological developments in ICT as India and other countries have done.

Table 5: Sources of economic growth in services in India

Period	Output per worker	Physical capital	Contribution	
			Education	TFP
1973-83	1.0	0.0	0.5	0.5
1983-93	2.7	0.3	0.4	2.0
1993-99	7.0	1.5	0.5	4.9
1999-2004	4.4	0.9	0.4	3.1
1980-2004	4.0	0.7	0.4	2.9

Source: Bosworth, Collins and Virmani (2006).

Why this is so needs further research, but the security situation has undoubtedly hindered Pakistan from taking advantage of growing and large markets for software exports and services, the back offices of which (as in the case of India) are located in the home country. The perceived risk associated with visiting these facilities by foreign firms (including much higher insurance coverage for their employees when travelling to Pakistan) has acted as a barrier, although some of these hindrances are being removed gradually as the security situation improves.

In Pakistan, as in India, the number of urban shopping malls has increased. Indeed, many large businesspersons are moving from industry or diversifying into setting up immense shopping malls, an example being the Nishat Group, which is setting up a large mall in Lahore.

An important conclusion that emerges from studies on Pakistan and India is that economic reforms that open up this sector to greater private participation,¹⁴ free it from a host of government controls and allow the use of prime urban land¹⁵ can all help greatly to unleash the sector's potential in Pakistan (see Mahfooz & Mahmood, 2015).

It may also be important to revamp the collection and computation of data on the services sector at the Pakistan Bureau of Statistics. Data for many of the subsectors is still indirectly derived, based on past assumptions of growth that are no longer relevant in most cases, primarily due to the use of ICT. The sector's current contribution to GDP may be significantly underestimated and the data likely fails to capture a growing unrecorded informal economy in services.

¹⁴ As was done in telecommunications in the 1990s.

¹⁵ Currently disproportionately in government use.

4.5 Reallocation Effects

The reallocation of resources from less productive to more productive activities is potentially an important source of growth. Using the Shapley decomposition methodology, changes in aggregate output per worker can be decomposed into changes in output per worker within and between sectors. The effect of an increase in output per worker within a sector depends on its share of total employment: a rise in labor productivity within a sector raises the average labor productivity. The reallocation of workers across sectors would increase average labor productivity only if the shift was from low-productivity sectors to high-productivity sectors.

Table 6 shows that, of the total increase in output per worker, services account for 46.6 percent, followed by industry (20.6 percent) and agriculture (18.8 percent). Again, this endorses the dynamism of the services sector.

Table 6: Decomposition of output per worker into within-sector changes in output per worker and inter-sectoral shifts, 1980–2015

	Contribution to change in total output per worker	
	PRs	%
Agriculture	18,924.3	18.8
Industry	20,711.3	20.6
Services	46,759.8	46.6
Inter-sectoral shift	14,051.3	14.0
Total change in output per worker	100,446.6	100.0

Source: Authors' calculations using the World Bank's Job Generation and Growth Decomposition Tool.

Inter-sectoral shifts account for a positive contribution of 14 percent over the span of 35 years. Although the figure is positive, implying that, on average, labor moved from lower-than-average-productivity sectors to above-average-productivity sectors, it is still quite low. Inter-sectoral shifts are usually associated with labor shifting from the subsistence or agriculture sector to industry and then services – the traditional path to economic development. However, in the case of Pakistan, employment growth in the agriculture sector has risen and the share of employed labor still averages 40 percent. In contrast, India's employed labor force has shifted from agriculture to services, although neither country has managed

to create jobs in the industry sector, particularly in manufacturing. This reflects the 'productivity trap' in Pakistan by exhibiting the inability of the labor force to move from areas of low productivity to high productivity.

5. Conclusion

Despite the limitations inherent in the assumptions of the growth accounting model used as well as lack of adequate data, our results are robust enough to draw the following main conclusions.

The first is that there is a clear and strong association between output, productivity and TFP growth and that the maximum TFP gains and their contribution to growth are realized during periods of high-output growth. The second is that the dynamics of this relationship vary, especially between industry (which is dominated by manufacturing) and agriculture. In the case of industry, the cause is primarily output growth driven by higher levels of investment that bring with it new machinery embodying the latest knowledge and technology. This results in higher TFP growth and the larger contribution of TFP to output growth (as implied by Kaldor–Verdoorn's Law). In contrast, growth in agriculture is more supply-driven, with increased use of inputs and the introduction of high-yield seed varieties or diversification to higher-value crops or new subsectors such as livestock and dairy driving the growth of output, productivity and TFP. The contribution of physical capital to output growth is, therefore, relatively far lower.

There is considerable unrealized potential in TFP growth in services in Pakistan, as our comparison with India shows, and much scope for introducing economic reforms that would foster productivity growth through improved efficiency in factor use and incentives for introducing new technology (ICT). This is especially true of deregulation measures that would encourage more competition and private sector participation.

Our results do not support fully the view propounded by López-Cálix et al. (2012) that output growth in Pakistan has been driven primarily by increased use of labor and capital and not TFP growth (as in the East Asian economies), but that a major factor contributing to low TFP growth has been the abysmally low and falling levels of investment in the economy. The latter has affected the stock and vintage of physical capital and the contribution of labor has varied across time periods and sectors.

While there is considerable scope for economic reforms that would lead to higher output and TFP growth, the results of our study suggest that the gains from reforms can only be realized in a period of high-output growth. This may be a major reason that reforms were less successful in industry compared to agriculture.

The contribution of human capital to Pakistan's economic growth remains disappointingly low despite a major thrust to improve education and skills indicators, implying that these have still not reached the minimum threshold at which they could be a significant factor in driving economic growth.

Finally, there may be real gains if there was a shift in emphasis to research focused on the agriculture sector as well as a critical review of why existing research institutions in agriculture have failed to deliver tangible results.

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