Sectoral
Total Factor Productivity
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Preface

Arguably, productivity is one of the key building blocks for global competitiveness. Evidence suggests that total factor productivity growth is positively correlated with GDP growth. As Pakistan continues to search for high and sustainable export-led growth, it is crucial to keep sight of the most critical denominator of the objective: productivity – its significance in the recipe for growth remains unmatched.

We are well aware of the challenges faced by Pakistan; economists have spoken at length about the twin deficits and elevated debt levels, whose roots probably intertwine with the country's productivity structure. Reasons for Pakistan's boom and bust cycles would surely identify low productivity as one of the culprits of the inconsistent growth path besides highlighting it as one of the causes for the country's myriad engagements with the International Monetary Fund (IMF). Perhaps the national desire to maintain a consistent and stable macroeconomic environment may only be possible if the "business model" of the economy is structurally appropriate to grow and generate resources to maintain manageable debt levels and keep current and fiscal account balances in check.

If Pakistan is to grow and aspires to follow the path of export-led growth, then it becomes relevant to understand, as minutely as possible, where we stand today in terms of total factor productivity growth vis-à-vis various sectors, including export-oriented sectors which compete at the international level. This endeavor is an attempt to contribute to limited research and data in the area of sectoral total factor productivity and has been worked upon with the expectation that it can be used by policymakers to make informed decisions on how to support sectors as we embark on our journey to seek export-led growth and develop a more stable macro-economic environment.

If we are not competitive globally, we cannot export, which switches off one of the key engines of foreign currency contributors to the economy. With circa one-third of total debt denominated in foreign currency, the country is, therefore, pressed to take on large foreign currency budgetary support loans in the name of development: the importance of productivity is just not only confined to being competitive but also has the potential to shake the foundations of our macro-economic environment and the development process as well.

As the team culminates this initiative, I would like to thank the honorable Minister for Planning, Development & Special Initiatives (MoPD&SI), Professor Ahsan Iqbal and Secretary, MoPD&SI, Mr. Syed Zafar Ali Shah for their ardent support for the effort. I would also like to offer special words of appreciation for Dr. Jehanzeb Khan, ex-Deputy Chairman, Planning Commission (currently Special Assistant to the Prime Minister on Government Effectiveness), for his sage guidance and Mr. Hamid Yaquoob Sheikh, ex-Secretary, MoPD&SI (currently Secretary, Ministry of Finance), for helping the Planning Commission in the endeavor. The support provided by the Chairman, the Securities Exchange Commission of Pakistan ought to be recognized as well.

I would like to thank Dr. Nadeem ul Haque, Vice-Chancellor, PIDE, and partners at the Pakistan Institute of Development Economics (PIDE) who have spearheaded this initiative. I am also thankful to Mr. Gonzalo Varela, Senior Economist World Bank Islamabad, for his valuable comments on the study during the workshop held at the Planning Commission, which helped improve the study; also grateful to all other participants of the workshop who provided useful insights.

I hope that potential derivations of the study are viewed with an open mind, both by the public and private sector representatives and that we, as a nation, refocus improvement in productivity as a core pillar of Pakistan's economic charter in times to follow.

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Executive Summary

Total factor productivity (TFP) growth is a key determinant of long-run output growth. Countries that manage to boost their TFP growth, grow at a much higher rate and for a sustained period. On the other hand, those countries that grow without a significant contribution from the TFP growth experience difficulty in maintaining a sustainable growth trajectory. Evidence shows that:

▬ Economies that had TFP growth of more than 3 percent had a GDP growth rate of 8 percent or more, whereas:

▬ TFP growth of less than 3 percent was associated with a GDP growth rate between 3 and 7 percent, enunciating a positive correlation between TFP growth and GDP growth.

The economy-wide TFP growth estimates show that both TFP and GDP growth have been erratic in Pakistan since the early 1970s. For some years, TFP growth has even remained negative. Moreover, the economy-wide TFP growth, according to different estimates, has hovered around 2 percent over the last few decades.

While the economy-wide TFP estimates are indicative, sectoral estimates are significant to understand productivity at various sub-macro levels. Firm data needed for sectoral estimates has been difficult to obtain, especially for those firms that are not listed on the stock exchange. The study has tried to address this void to gain a better understanding of productivity trends. The study has used firm-level data to estimate TFP and used these to obtain average sectoral estimates, a bottom-up approach.

The study has estimated firm-level and sectoral TFP growth based on Harmonized System 2 (HS-2) level codes. 1,321 firms are divided into 61 sectors with each firm's data spanning a period from 2010 to 2020. Firm-level data of listed and non-listed public firms, obtained from the Securities and Exchange Commission of Pakistan (SECP), is included in the analysis.

The study's results show that the average TFP growth for all the 61 sectors included in the analysis during 2010-2020 remained at 1.5 percent. Low TFP growth implies that the economy has not been productive over time. Moreover, lower productivity implies that the economy is not competitive compared to the economies that have higher TFP growth, which could harbinger consequences for Pakistan's push for a larger share of the global export market's wallet. Low productivity could be due to a combination of factors:

Inadequate skill composition of the workforce	Poor and non-professional management practices	Low capacity utilization
Volatile country and organizational policy measures	Slow technology adoption	Lack of R&D and innovation

Dividing the 61 sectors into three categories, i.e., high TFP growth (TFP growth greater than 3 percent), medium/low TFP growth (TFP growth between 0 and 2.9 percent), and negative TFP growth (TFP growth below 0 percent), the study found that:

- Most of the sectors that have high TFP growth are either services-related or tech-based;

- Most of the sectors in the medium/low TFP growth category are in manufacturing. Two export-designated sectors, i.e., sports goods and textile composite, also feature in medium/low TFP growth sectors;

- Most negative TFP growth sectors are in manufacturing. This category captures three export-designated sectors (textile spinning, textile weaving, leather and tanneries) amongst other salient industries such as fertilizer and automobiles.

The analysis also precipitates a trend between sectors that receive subsidies and medium/low TFP growth or negative TFP growth categories. Similarly, the export share of each of these sectors, barring the textile sector, in global exports is less than one percent in their respective category.

According to the analysis, on average, the services sectors have higher TFP growth than the manufacturing sectors.

▬   One plausible reason for this could be greater competition in services;

▬   On the other hand, the manufacturing sectors are protected in Pakistan, which insulates them from competition; protecting a sector retards any incentive to improve efficiency.

The services sectors could also be more productive because of digitization. Similarly, flexibility in technology adoption could be another factor. It is often observed that Pakistani firms in the manufacturing sector are primarily family-owned and managed, and are in general averse to modern management practices, which inhibits productivity growth.

Analysis has also highlighted some other interesting and important aspects:

▬   Export-designated sectors (not necessarily export-oriented firms in a sector) have either low or negative TFP growth;

▬   Sectors that are the recipients of subsidies have low to negative TFP growth;

▬   There is almost no presence of Pakistani exports in top global export sectors/industries, while sectors that have high TFP growth are not major export contributors.

These observations have some important derivations and potential implications:

▬   Negative TFP growth in sectors that receive subsidies is essentially a dead-weight loss to the economy. It also acts as a barrier to private sector development;

▬   The below-average and negative TFP growth of the export-designated sectors poses an area of concern. It suggests that policies and incentives have not helped in

improving productivity suggesting a need to revisit and reorient policies, especially incentives purely to propagate productivity. This aspect takes center stage, especially in light of the Government of Pakistan's (GoP) push for augmenting exports in the traditional and non-traditional sectors;

■   Low productivity may be associated with adverse policy environment such as Statutory Regulatory Orders (SROs) and policy instability reflected in frequent changes in the areas of taxes and tariffs, amongst others.

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Abbreviations

CMI	Census of Manufacturing Industries
GDP	Gross Domestic Product
GoP	Government of Pakistan
HS	Harmonized System
SITC	Standard International Trade Classification
SECP	Securities and Exchange Commission of Pakistan
SRO	Statutory Regulatory Orders
TFP	Total Factor Productivity
USD	United States Dollar

1. Setting The Stage: The Data

Data from 1,321 firms based on their audited financials spanning from 2010 to 2020 is used to arrive at firm-level TFP estimates. The analysis excluded 2009 data as it is an outlier in the wake of the 2008 Global Financial Crisis, which affected firms' performance globally. Data spans 11 years, providing 14,586 observations to estimate firm-level TFP. Both listed and non-listed public firms are included in the analysis. The data of non-listed firms is obtained from the Securities and Exchange Commission of Pakistan (SECP).[1] The listed firms' data is obtained from the State Bank of Pakistan's website, which is openly accessible. Based on HS-2 level codes, 1,321 firms are categorized into 61 sectors. It must be noted that TFP for such a large number of sectors has never been calculated in Pakistan making the study and its outcomes a novel contribution to the TFP growth literature and research, and hopefully will serve as data-driven input to policymakers' decisions.

Box 1. Public Listed and Non-listed Firms

•   Publicly listed firms generally represent larger companies in the economy. They require at least seven directors to qualify for the stock exchange in Pakistan. It is difficult to obtain a large amount of capital for private companies, while listed firms can raise funds by selling their shares at the stock exchange.

•   The publicly unlisted firms require more than two directors but they are not listed on the stock exchange. The unlisted companies may be too small in terms of capital size or may not be able to fulfill the requirement to be listed on the stock exchange.

•   However, both types of firms are registered with the SECP and required to submit their financial accounts to the SECP annually.

Although there are other sources[2] from which data can be obtained to calculate firm-level TFP growth, it is pertinent to mention that the data used in this analysis is obtained directly from the firms' audited financial statements.

Figure 1 below gives the breakdown of the sample according to the number of firms in each sector.

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[1] The data is confidential.

[2] One of the sources to obtain data is the Census of Manufacturing Industries (CMI). However, at least three caveats must be kept in mind while using the CMI data: CMI data is not available as a long time series. The latest year for which the CMI data is available is 2015-16; the CMI, as the name suggests, covers only manufacturing firms; and the CMI data is collected through a questionnaire, which can have biases as at times managers only report ballpark figures.

Figure 1. Sample Distribution - Number of Firms in Each Sector

Sector	Number of Firms
Textile Spinning	143
Textile Composition	132
Insurance Companies	81
Finance & Banking - Allied	73
Investment Companies	57
Sugar & Allied	57
Chemicals & Pharmaceuticals	54
Power Generation & Allied	53
Modaraba	35
Financial Services	34
Pharmaceutical	33
Services - Allied	33
Internet Provider & Tech	32
Food & Personal Care Products	30
Cement	26
Brokerage Houses	25
Engineering	25
Miscellaneous	25
Oil & Gas Marketing	23
Textile Weaving	22
Automobile Assemblers	19
Electrical Goods	18
Paper & Board - Allied	18
Power Gen & Dist.	18
Oil & Gas Exploration	15
Steel & Allied	15
Food & Beverages - Allied	14
Glass & Ceramics	14
Synthetic & Rayon	14
Automobile Parts/Accessories	13
Real Estate	13
Construction	12
Fertilizer	10
Hotel Industry	10
Vanaspati - Allied	10
Import/Export	9
Leasing Companies	9
Consultancy Services	8
Jute	8
Leather & Tanneries	8
Asset Mgmt. Cos	7
Plastic Products	6
Transport - Allied	6
Wholesale/Retail	6
Investment Advisory Services	5
Auto & Allied	4
Tobacco	4
Alternate Energy	3
Cooking Oil	3
Education -Allied	3
Healthcare - Allied	3
Poultry	3
Tin Plating	3
Wood/Wood Products -Allied	3
Airlines	2
Hospitals/Clinic	2
Information Technology - Allied	2
Logistic Support	2
Mining & Quarrying - Allied	2
Printing & Publishing	2
Sports Products	2

Source: Authors' calculations based on the SECP data

As Figure 1 shows, most of the firms are in the manufacturing sector in the sample of 1,321 firms. In manufacturing, most of the firms are in the textile sector. In the services sector, the insurance sector has the highest number of firms amounting to 81, followed by the finance and banking sector, which has 73 firms.

Table 1 gives key statistics pertaining to the data coverage.

Table 1. Data Coverage - Key Statistics (2019)

Indicator	Statistic
Number of Firms*	1,321
Total Sales (% of GDP)	28
Total Sales (USD Billion)	80
Employees	>2 million
Material (% of GDP)	20
Pakistan - Selected Aggregate Indicators:	
Exports (USD Billion)	23.3
GDP (USD Billion)	278.2

Source: Authors' calculations based on firms' financial statements, trade statistics, and national accounts. *The number of firms includes listed companies & unlisted companies with 2 or more directors (see Box 1 for details).

The firms included in the analysis have a reasonably large coverage of Pakistan's economy. For example, as shown in Table 1, the total sales of 1,321 firms included in the sample are 28 percent of the GDP. Similarly, materials used by these firms are 20 percent of the GDP. Moreover, the labor employed in these firms exceeded 2 million.
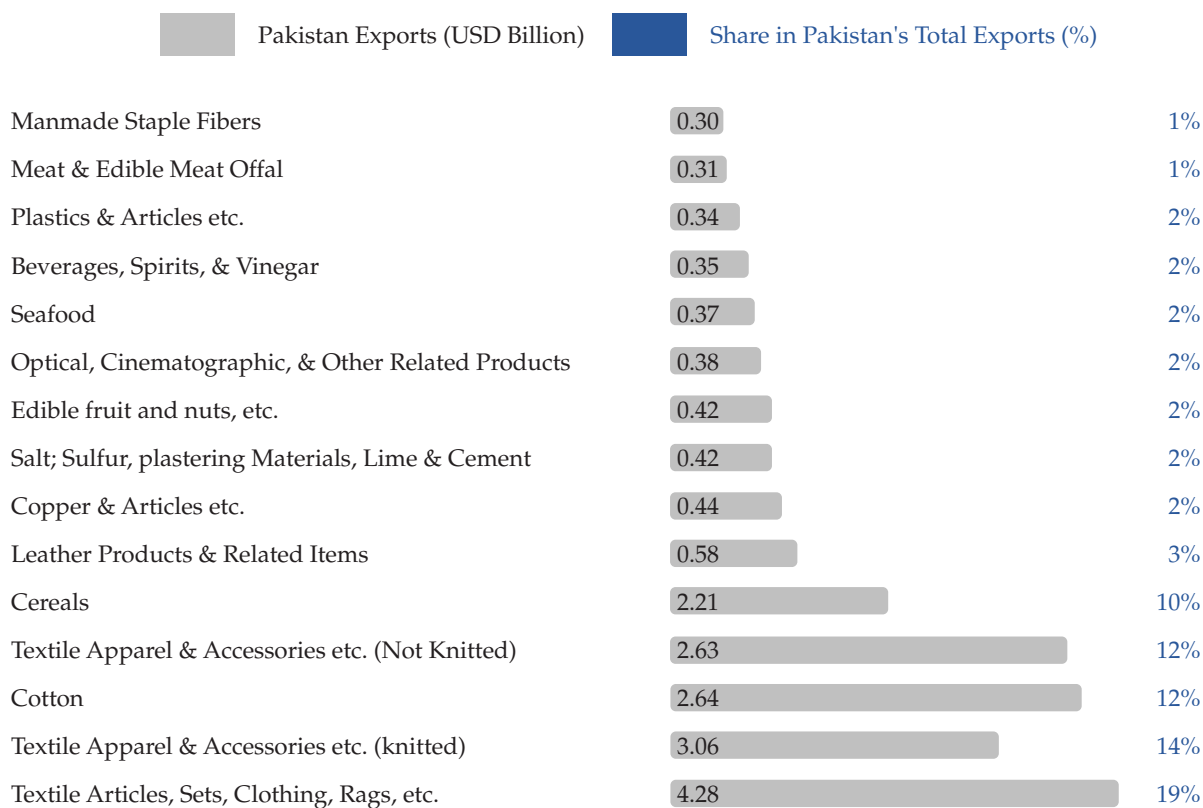
Figure 2 shows the top global exporting sectors according to HS-2 classification, along with their shares in respective total global exports. Similarly, Figure 3 shows Pakistan's top exporting sectors along with their shares in Pakistan's total exports. It is evident from Figure 3 that not many of Pakistan's top export sectors figure in the top global export sectors. As Figure 2 shows, top global exports are in the electrical equipment and machinery sectors, whereas Pakistan's top exports are in the textile and allied sectors, amounting to USD 4.08 billion.

Figure 2. Top 15 Global Exporting Sectors (2020)

	Global Exports (USD Billion)		Share in Global Exports (%)
Miscellaneous Chemical Products	225		1%
Ores, Slag & Ash	254		1%
Furniture and Other Related Products	264		2%
Iron or Steel Articles	286		2%
Commodities not Elsewhere Specified	303		2%
Iron & Steel	328		2%
Organic Chemicals	385		2%
Optical, Cinematographic, & Other Related Products	591		3%
Plastics and Articles thereof	611		3%
Pharmaceutical Products	681		4%
Natural and Cultured Pearls etc.	716		4%
Vehicles other than Railway or Tramway Rolling Stock, etc.	1,282		7%
Mineral Fuels and Oils with Products	1,610		9%
Machinery and Mechanical Appliances & Parts	2,097		12%
Electrical and Electronic Equipments & Parts	2,775		16%

Source: Calculations based on UN COMTRADE and ITC statistics
Note: Figures are rounded off.

It is evident from Figure 2 that top global exports consist of high-tech products, which require R&D and innovation. Other than that, top global exports also feature high-precision products, such as optical and related products. In comparison, Pakistan's top exports, as shown in Figure 3, unsurprisingly feature textile products. Pakistan also exports optical, cinematographic and other related products but these only amounted to 0.37 billion USD and had only a 2 percent share in Pakistan's total exports. It is important to note that Pakistan also exports agricultural and related products (for example, meat, seafood, cotton, and cereals), whereas the top 15 global exports do not feature such products.

Figure 3. Pakistan's Top 15 Exporting Sectors (2020)

	Pakistan Exports (USD Billion)	Share in Pakistan's Total Exports (%)
Manmade Staple Fibers	0.30	1%
Meat & Edible Meat Offal	0.31	1%
Plastics & Articles etc.	0.34	2%
Beverages, Spirits, & Vinegar	0.35	2%
Seafood	0.37	2%
Optical, Cinematographic, & Other Related Products	0.38	2%
Edible fruit and nuts, etc.	0.42	2%
Salt; Sulfur, plastering Materials, Lime & Cement	0.42	2%
Copper & Articles etc.	0.44	2%
Leather Products & Related Items	0.58	3%
Cereals	2.21	10%
Textile Apparel & Accessories etc. (Not Knitted)	2.63	12%
Cotton	2.64	12%
Textile Apparel & Accessories etc. (knitted)	3.06	14%
Textile Articles, Sets, Clothing, Rags, etc.	4.28	19%

Source: Calculations based on UN COMTRADE and ITC statistics
Note: Figures are rounded off.

Pakistan has been trying to boost its exports but despite many efforts, Pakistan's exports have been stagnant. For Pakistan to boost its value of exports, it will have to not only diversify its export product base but also endeavor to target industries with large global export wallets, which are in advanced manufacturing products. Currently, Pakistan's exports are concentrated in traditional sectors.

## 2. Link Between Total Factor Productivity & Economic Growth

Total factor productivity (TFP) growth is a key determinant of long-run output growth. According to Warren Buffet, the TFP is the "secret sauce" in the US economic success story over the last 150 years (Lambert, 2016). Countries that manage to boost TFP growth, grow at a much higher rate and for a sustained period. In G7, G12, and G20 countries, TFP growth has a greater impact on GDP per capita growth than fixed capital formation and employed labor (Yalçınkaya et al., 2017). On the other hand, those countries that grow without a significant contribution from the TFP growth experience difficulty in maintaining sustainable GDP growth.

Economic growth based on the expansion of inputs rather than on an increase in output per unit of input inevitably declines. For example, the impressive economic growth in the Soviet Union in the 1950s and the 1960s was based mainly on savings. Therefore, unless the economies do not adjust to produce more and better output efficiently, they will experience diminishing returns (Krugman, 1994).

Citi GPS (2018) shows that in the sample of countries included in the analysis, 60 percent of the countries that had TFP growth of more than 3 percent grew at 8 percent or more (Figure 4). On the other hand, lower TFP growth rates were associated with lower GDP growth rates, as the figure shows. For example, 80 percent of the countries that had TFP growth rates of equal to or less than one percent, had GDP growth rates in the 0-3 percent range. Therefore, this analysis shows a strong and positive correlation between the TFP growth rate and the GDP growth rate.
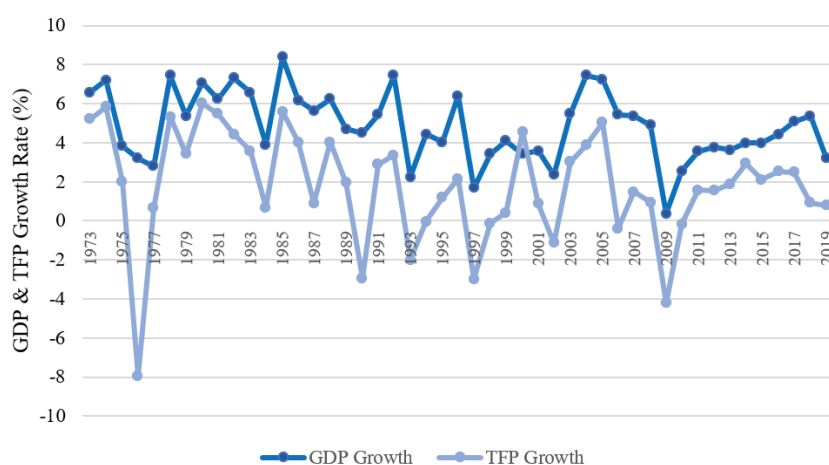
Box 2. What is Total Factor Productivity?

•	In the growth accounting framework, Total Factor Productivity (TFP), also known as multifactor productivity, is that part of the GDP growth that cannot be attributed to factor inputs, including labor, capital, human capital, and materials.

•	The TFP conveys how productively an economy uses its factors of production to produce output.

•	It reflects a shift in the production function arising from technological progress (Barro, 1999).

•	TFP may also increase economic growth by signifying appropriate and efficient resource allocation, resulting in production achieving close to 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.

•	TFP may also contribute to higher economic growth through the impact 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.

Figure 4. TFP Growth and GDP Growth Correlation
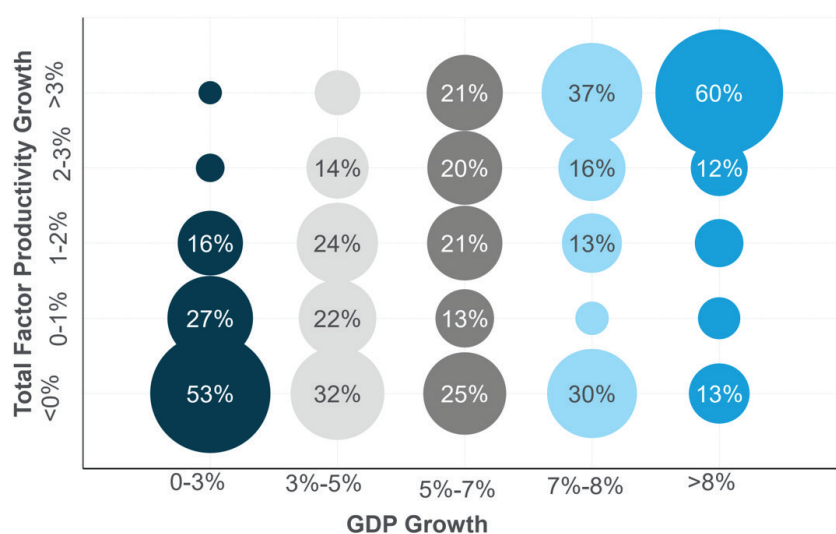
Note: Bubble size represents the percentage of instances at different levels of GDP growth. For example, if GDP growth is higher than 8%, then in 60% of cases TFP growth is greater than 3%.
Source: TED, Citi Research (Citi GPS, 2018)

The economy-wide estimates of TFP growth in Pakistan show that the growth rates of both TFP and GDP have been erratic since the early 1970s (Figure 5). TFP growth, as can be seen from the figure, even dipped below zero in several years. The figure also shows that TFP and GDP growth move together, i.e., when TFP growth increases GDP growth also increases and vice versa. The declining trend in economy-wide TFP growth is also documented by other studies (see, for example, Javaid & Ahmed, 2021).

Figure 5. Economy-Wide GDP & TFP Growth Rates: 1972-2019

Source: Siddique (2020)

3. Importance of Sectoral Total Factor Productivity Estimates

Economy-wide estimates show low TFP growth in Pakistan. However, the economy-wide estimates present a macro overview. On the other hand, sectoral estimates help to understand what is happening in terms of productivity growth at micro and sub-sectoral levels. Going beyond macro estimates to sectoral and firm levels gains even more importance in the backdrop of the country's need to become export-oriented. There are sparse estimates of sectoral TFP growth in Pakistan available. For example, one study (Chaudhary, 2018) showed that although some firms have improved over time, local firms lag global peers. However, this study looked only at the firms in the manufacturing sectors. Another study by Lovo & Varela (2022) looked at the global integration of Pakistani firms and productivity. The study found that Pakistan's globally integrated firms perform better in terms of TFP. However, the study used data only from pubicly listed firms. There is, therefore, a need to document sectoral TFP growth trends in Pakistan with a bottom-up approach. The present study attempts to fill this gap. Therefore, it is hoped that the study will make a major contribution to the existing research on the topic and document evidence on sectoral TFP growth estimates using firm-level data.

The bottom-up sectoral TFP estimates are important because these estimates will help address the following:

- Show how different sectors compare in terms of TFP growth;

- Provide an indication of how competitive are various sectors;

- Help to understand the performance of the sectors, in terms of TFP growth, that are beneficiaries of government policies and subsidies;

- Highlight TFP growth trends in the export-oriented and export-designated sectors and related performance;

- Help in understanding and addressing a range of policy questions relevant to underinvestment, unemployment, and low growth.

4. Estimates of Sectoral Total Factor Productivity Growth

To calculate TFP growth, sectors are divided into three categories, namely, high TFP growth sectors, medium/low TFP growth sectors, and negative TFP growth sectors. High TFP growth sectors are those that registered TFP growth of more than 3 percent, medium/low TFP growth sectors are those that fall between 0-2.9 percent TFP growth, and the low TFP growth sectors showed negative TFP growth (see Box 3 for the methodology for estimating sectoral TFP growth).

TFP growth based on the complete data, from 2010 to 2020 is shown in Figure 6 below. The dotted line is the average TFP growth – 1.5 percent – for all the sectors during the 2010-2020 period.

One thing that is clear from Figure 6 is that while in some years sectoral TFP growth is higher than average (i.e., than 1.5 percent growth), high TFP growth is offset by negative TFP growth in some years. It pulled the average TFP growth for the entire period (2010-2020) down. As argued in this study and also in the literature, for sustainable GDP growth, persistently high TFP growth is of critical importance.

Box 3. Total Factor Productivity Estimation - Methodology

- Well-established literature, theoretical and empirical, discusses the link between within-sector productivity variation across firms (Banerjee and Duflo 2005, Restuccia and Rogerson 2008, Hsieh and Klenow 2009, Bartelsman et al. 2013). Using firm-level data, the TFP variation across firms within the sector and across sectors in Pakistan is estimated.

- The Cobb-Douglas production function is used to estimate firm-level TFP. The Cobb-Douglas specification is further used to control for the differences in firm-level and sector-level characteristics and unobservables. The following specification s used to estimate the firm-level TFP.

$$y_{ijt} = \beta_0 + \vartheta k_{ijt} + \varphi l_{ijt} + \Phi m_{ijt} + \sum_k (\rho_i, \tau_t, \mu_j) + \varepsilon_{ijt}$$

Where i represents the firms, j represents the sectors, t represents the particular year, and y, k, l, and m represent total sales, labor, the value of capital, and the cost of material, respectively. This specification estimates the elasticities of capital, labor, and material. The estimated elasticities are used to factor out the firm-level total factor productivity. Finally, the estimated firm-level TFP is used to drive the weighted average sector-level TFP.

- Furthermore, materials include inputs other than labor and capital. Since energy input is not reported explicitly on the company's balance sheets, it is a part of the raw material, utilities, and other manufacturing costs. Therefore, the energy input is accounted for in estimating TFP.

- Ideally, sectoral prices should be used to deflate the data. However, sectoral prices are not available, particularly for each sector included in the analysis. Therefore, the GDP deflator was used. The GDP deflator is a good proxy indicator as it incorporates both direct and indirect price variations. Therefore, results should be interpreted with the caveat in mind that sales values are not deflated with sector/product price values due to the non-availability of data.

Figure 6. Sectoral TFP Growth in Pakistan: 2010 to 2020
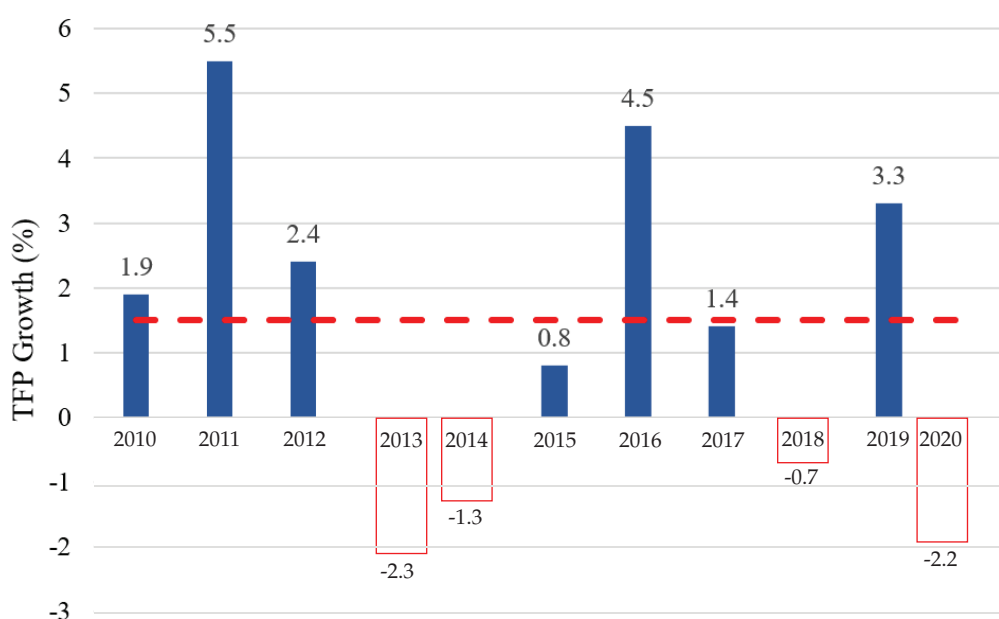
Source: Authors' calculations

Figure 6 presents some potential derivations: Apart from the observation that the average TFP growth during the 2010-2020 period was 1.5 percent, our estimates show that the TFP growth was negative in four out of 11 years in 2013, 2014, 2018, and 2020. Negative TFP growth could be due to retrogression in technology but that is improbable because once a technology is acquired, it is hard to lose it. It is interesting to note that 3 out of 4 times TFP growth turned negative around election times, while the fourth episode was in the COVID year. This could potentially imply that TFP is majorly impacted by changes in the macro environment and policy stability.

Negative TFP growth in some years and overall low TFP growth is worrisome, especially in the pursuit of export-oriented policies and growth. Low TFP growth implies that the economy is not very productive. Moreover, lower productivity means that the economy may not be competitive compared to other economies that have high TFP growth. Overall, low productivity could be due to a combination of the following factors:

■   Skill composition of the workforce not conducive to productivity;

■   Suboptimal management practices and capacity utilization;

- ■ Arbitrary policy measures;

- ■ Technology adoption;

- ■ Lack of innovation.

Figure 7 below shows the sectors that registered high TFP growth, i.e., TFP growth greater than 3 percent during the period of analysis. The TFP growth estimates shown in the figure are averages for the period.

Figure 7. High TFP Growth Sectors
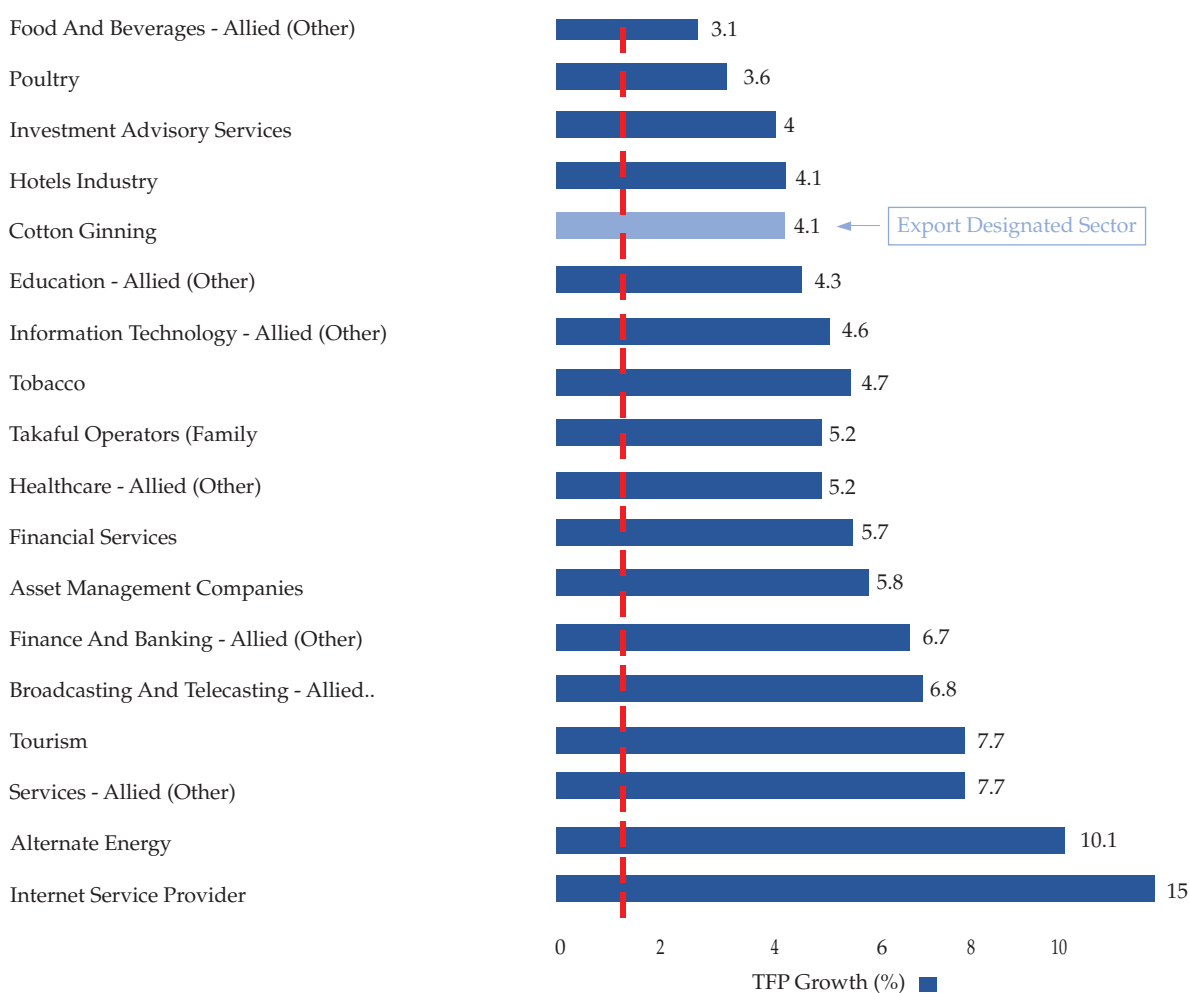
Source: Authors' calculations

In Figure 7, the red dotted line, as in Figure 6, denotes the average TFP growth rate (1.5 percent) for all the sectors during the entire period. It is evident from the figure that most of the sectors that have shown high TFP growth are either services-oriented or tech-based.

Figure 8 shows those sectors that had TFP growth between 0 and 2.9 percent during the analysis period.

Figure 8. Medium/Low TFP Growth Sectors
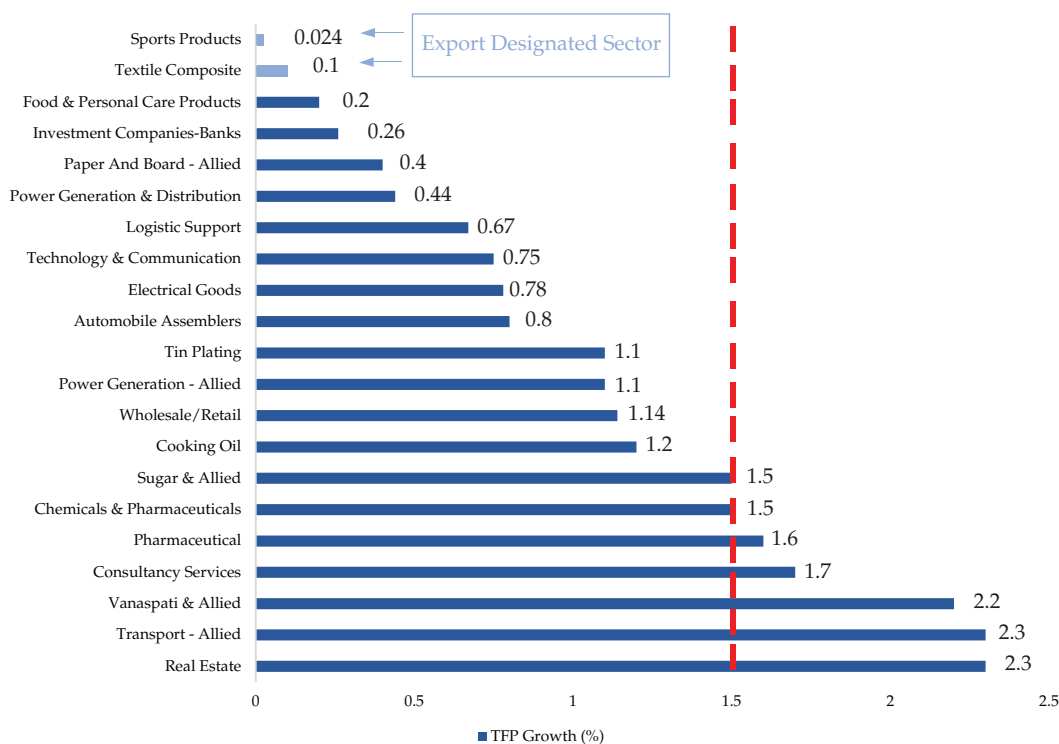
Source: Authors' calculations

Most of the sectors in the medium/low TFP growth category are in manufacturing. Two export-designated sectors, sports goods and textile composite, also feature in medium/low TFP growth sectors. Their TFP growth is 0.024 and 0.1 percent, respectively. Such low TFP growth in the textile composite sector certainly poses a moment of pondering for policymakers as the sector has been receiving government support in one form or another for decades. Similarly, the sports sector, which is predominantly export-oriented, has very low TFP growth. Figures, in turn, suggest that despite earning useful foreign exchange for Pakistan, productivity and efficiency growth levels remain critically low. This sector has also been receiving various benefits from the government. Interestingly, sectors such as sugar and pharmaceutical sectors are also in this category. Another interesting result is the above-average TFP growth of the real estate sector, although the sector largely caters to the needs of the domestic market.

Figure 9 lists sectors that have fared the worst in terms of TFP growth over the 2010-2020 period. These sectors showed negative TFP growth, ranging between -0.1 percent and -5 percent.

Figure 9. Negative TFP Growth Sectors
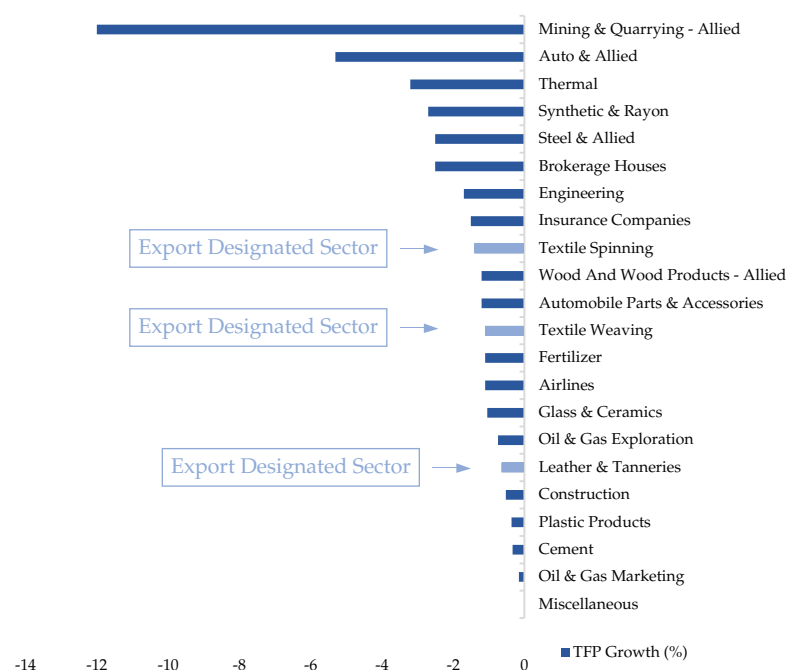
Source: Authors' calculations

The negative TFP growth sectors mostly are in manufacturing. Three of these sectors – textile spinning, textile weaving, and leather and tanneries – are export-designated sectors. All export-designated sectors receive preferential treatment to augment exports – a government policy for several years. However, over the dataset period, these sectors appear to have not performed efficiently, which is shown by negative TFP growth. Moreover, the negative TFP growth sectors also include, among others, automotive-related, fertilizer, and construction sectors. While not export-oriented in nature, these sectors have also been facilitated by budgeted and unbudgeted subsidies. The above-mentioned sectors play a crucial role in the growth of the economy with some of the sectors representing bedrocks of large-scale manufacturing (LSM) and agriculture. However, having negative TFP growth in such critical sectors poses a question to policymakers and a need to craft incentives in a way to make efficient use of the country's production factors.

It is important to clarify that in this study, the sectors are treated as a whole. Information on firms that export within a sector was not collected. It is plausible that the exporting firms within a sector had positive and higher TFP growth as compared to other firms in the same sector that did not export their products. For example, there is a possibility that firms in the leather & tanneries sector (Figure 9) that exported their products had positive and higher TFP growth than those firms which were focused on local sales only. The same could be the case with other export-designated sectors. Furthermore, some evidence shows that globally integrated firms in Pakistan perform better in terms of productivity (Lovo & Varela, 2022).

Table 2 below shows TFP growth in selected sectors that have received or currently receive subsidies. The table also shows Pakistan's exports and global exports in these sectors.

Table 2. TFP Growth in Selected Subsidy-Receiving Sectors

Sectors	TFP Growth (%)	Subsidy (Yes/No)	Exports (USD Billion) 2020	Global Exports (USD Billion) 2020	Global Exports Share in World Exports (%)
Textile	-1.00	Yes	12.9*	1,140*	1.00
Leather & Tanneries	-0.67	Yes	0.141*	13.8*	0.02
Sports Products	0.02	Yes	0.45***	19***	0.96
Food Processing	1.80	Yes	3.73**	1,170**	0.31
Logistics	0.62	Yes	0.61*	817*	0.02
Automobile	-1.90	Yes	0.10*	1,540*	0.01
Fertilizer	-1.10	Yes	0.000636*	57.7*	0
Engineering	-0.52	Yes	0.892*^	5,320*^	0

Source: Calculations based on The Atlas of Economics Complexity, CID Harvard. *Denotes the whole sector according to HS-01 classification; ** denotes the whole sector according to SITC classification for exports; *** denotes the sub-sector at 6 digit level according to HS classification for exports; ^ denotes aggregation of machinery and electronics as one engineering sector.

All the sectors mentioned above that receive subsidies are either medium/low TFP growth sectors or negative TFP growth sectors. Similarly, the export share of all these sectors, barring the textile sector, in global exports is less than one percent. The fact that these sectors receive subsidies in different ways and yet their performance, both in terms of TFP growth and exports, dimensions an area that requires a debate to better formulate policies, especially incentives, and their sustainability in an ever-progressive and competitive global market.

A word of caution is in order while interpreting the results of the subsidy-productivity nexus. In many cases in Pakistan, subsidies are provided to specific firms and not to the whole sector. Ideally, the firms that receive targeted subsidies should be separated from the firms that do not receive or have not received any subsidy. However, gathering such information is a challenging task and has not been covered in the study. Nevertheless, there appears to be a negative relationship between subsidies and sectoral productivity.

5. Key Takeaways

Estimates of TFP growth in Pakistan's 61 sectors show that average TFP growth has been anaemic since 2010. On average, services sectors have higher TFP growth than manufacturing sectors. The difference could be due to a host of factors. For example, the services sectors, such as IT services, internet services, and financial services, among others, represent sectors that are more open to competition. On the other hand, manufacturing sectors, including the automobile sector, textiles, and fertilizer manufacturing, are provided various incentives. When a sector is provided incentives without a sunset clause, willingness to improve efficiency may reduce, while in the face of competition, a sector must improve its efficiency to survive and thrive. Moreover, services sectors are more embracive of digitization, which make them more efficient. Similarly, flexibility in technology adoption could be another factor. It is often observed that Pakistani firms in the manufacturing sector are family-owned and managed and are supposedly averse to modern management practices, which come in the way of becoming more productive. The analysis has also highlighted some other interesting and important facets:

- Export-designated sectors have either low or negative TFP growth; [3]

- Sectors that are the recipient of subsidies also have low to negative TFP growth; [4]

- There is almost no presence of Pakistani exports in top global exports, while the sectors that have high TFP growth are not major export contributors;

- During the 10 years of analysis, the TFP growth turned negative around the time of elections thrice and once during the COVID period. This could possibly suggest that the overall macro environment and political transitions may influence TFP growth.

These observations have some important implications. One such implication is that the negative TFP growth in the sectors that receive subsidies is essentially a deadweight loss to the economy. It also acts as a barrier to private sector development. Incentives ought to be provided with a focus on improving the productivity of the existing production setup for sustainable economic development. It is pertinent to mention that low productivity has also been associated with adverse policy environment such as the SROs and policy instability reflected in frequent changes in taxes and tariffs (PIDE Growth Agenda, 2021).

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[3] Although, as discussed above, it is possible that exporting firms in an export-designated sector have positive and high TFP growth.

[4] Ideally, as cautioned above, the firms that received subsidies in a sector should have been separated from the firms that did not receive any subsidy in that sector. However, this could not be done owning to the unavailability of the required data.

If Pakistan is to move toward a higher growth trajectory, steps must be taken to improve the productivity of the economy. Evidence suggests that whenever there have been episodes of liberalization and market-friendly policies, the TFP growth has increased, leading consequently, to improved economic performance (see Siddique, 2020). For example, in the 2000s, TFP and GDP growth took place due to better macroeconomic fundamentals, structural reforms, governance, and private sector dynamism. Certain structural reforms, i.e., financial sector restructuring, privatization, liberalization, and deregulation of the economy led toward a market-led economy. With potential derivations of the study in perspective, it may be useful for policymakers and other relevant stakeholders to analyze, embrace and discuss the numerical outcomes and analytical aspects of the study to better orient future policies for sustainable economic growth and development in Pakistan.

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