ANALYZING SECTOR-SPECIFIC FLOWS OF FIXED INVESTMENT AND MEASURING STOCK OF PHYSICAL CAPITAL IN PAKISTAN

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ABSTRACT

The current study aims to analyze sector-specific flows of fixed investment and estimate the stock of physical capital for various economic activities in Pakistan. Fixed investment flows have been examined using real growth rates and investment-to-GDP ratios from 2000 to 2025. Results indicate that the average growth of real fixed investment in Pakistan during this period was 2.94%, while the average investment-to-GDP ratio was 14.36%. This is significantly below the regional average of 32.0%, as well as neighboring India (34.0%) and Bangladesh (28.1%). The study also measures the stock of physical capital for specific economic activities using both linear and geometric methods in nominal and real terms. Real net capital stock in agriculture grew at average rates of 1.7% and 1.9% during 2000 to 2025, compared with 1.0% and 1.2% in industry, respectively. The net capital stock contracted in industry during FY 2001, FY 2002, FY 2010 to FY 2014, and FY 2021 to FY 2023. While the net capital stock has shown average growth of 4.4% and 4.5% in services, it has increased by 3.2% under each method for the overall economy during the study period. Analysis of the Incremental Capital-Output Ratio (ICOR) across various economic sectors shows that Pakistan maintained a long-term average ICOR of 1.40, with the ratio fluctuating from a high of +15.9 in FY 2009, indicating significant investment inefficiency, to a sharp decline of -13.94 in FY 2020 and -50.6 in FY 2023, a period marked by economic contraction where output fell despite capital inputs. However, if outliers are excluded, the average ICOR rises to 3.80. This high ICOR indicates that Pakistan's underlying investment efficiency is weaker and more volatile than the headline long-term average implies.

Keywords: *Fixed investment, Capital stock, Linear and Geometric methods, Consumption of Fixed Capital, Incremental Capital-Output Ratio (ICOR), Pakistan*

PREFACE

Pakistan is a capital-deficient country with the lowest investment-to-GDP ratio among regional economies. Therefore, the current study analyzes sector-specific flows of fixed investment using real growth rates and investment-to-GDP ratios for the period 2000 to 2025. Furthermore, the United Nations System of National Accounts (SNA) 2008 and OECD's Manual on Measuring Capital (2009) recognize capital statistics and consumption of fixed capital as important components of any country's national statistical system. However, these statistics are missing from the available macroeconomic aggregates of Pakistan compiled by the Pakistan Bureau of Statistics (PBS). Therefore, a research proposal to analyze sector-specific flows of fixed investment and to estimate statistics on physical capital stock was submitted under PIDE's Research for Social Transformation and Advancement (RASTA), Competitive Grants Program (CGP) 7.0. I am thankful to PIDE and RASTA for allowing us to research these important topics. I am also grateful to the anonymous reviewers and the RASTA Research Advisory Committee (RAC) members for their useful comments and suggestions on improving the methodology and the overall report.

In this research project, we have compiled estimates of capital stock and consumption of fixed capital for 19 detailed economic activities, e.g., crops, livestock, forestry, fishing, and mining, as well as four aggregates for agriculture, industry, services, and the overall economy, using linear and geometric methods in nominal and real terms. The timely completion of this report is the result of the dedicated efforts of the research team. This report comprises six parts: Introduction, Literature Review, Research Methodology, Findings and Discussion, Conclusion, and Recommendation/Policy Implications. The estimates of physical capital stock and consumption of fixed capital compiled in the study can be used for the analysis of sector-specific investment flows, the compilation of productivity statistics, the calculation of net macroeconomic aggregates, improved value-added in the general government, and the estimation of income GDP in Pakistan.

I am deeply indebted to our mentors, Mr. Zafar ul Hassan, Ex-Joint Chief Economist, and Dr. Imtiaz Ahmad, Chief Economist, Ministry of Planning, Development and Special Initiatives, Government of Pakistan, Islamabad, for their valuable guidance and continuous support throughout the process. On the mentors' recommendation, Incremental Capital-Output Ratios (ICOR) have also been compiled for agriculture, industry, services, and the overall economy for the period 2000 to 2025.

I hope this report will be useful for researchers, academicians, and policymakers alike. Suggestions for improvement are welcome.

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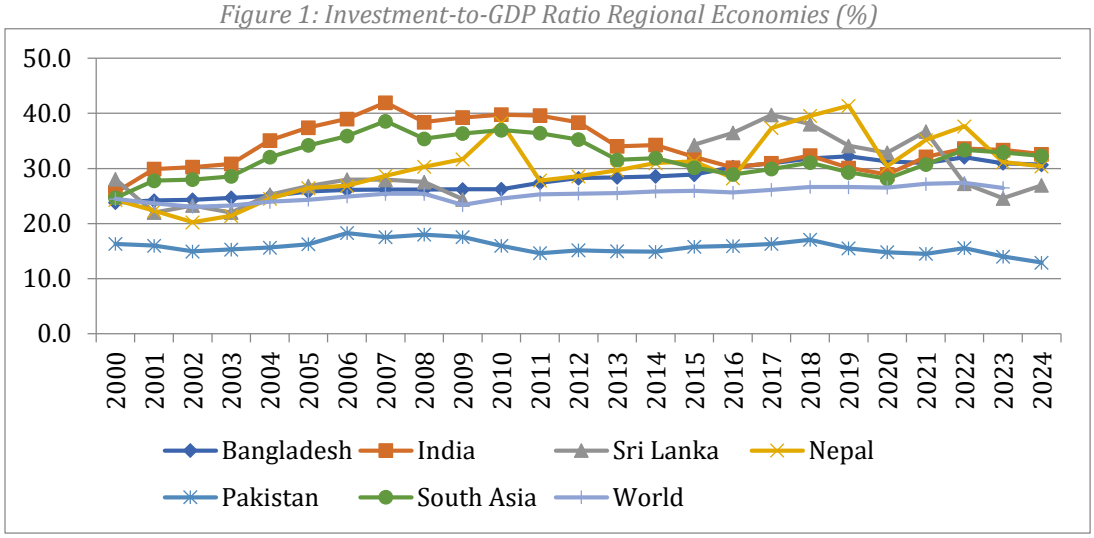
ABBREVIATIONS

ARDL	Autoregressive Distributed Lag
CFC	Consumption of Fixed Capital
FMOLS	Fully Modified Ordinary Least Squares
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
IWI	Inclusive Wealth Index
NCS	Net Capital Stock
OECD	Organisation for Economic Co-operation and Development
PBS	Pakistan Bureau of Statistics
PIM	Perpetual Inventory Method
SNA	System of National Accounts
UNEP	United Nations Environment Programme
VAR	Vector Auto Regression Model

INTRODUCTION

Key drivers of sustainable economic growth in Pakistan, as in other developing countries, include the labor force, physical capital (Ali, 2015; Ishfaq et al., 2024; Umair et al., 2024), and energy sources (Umair et al., 2024). Hence, investment in human and physical capital development can lead to enhanced output growth and improved efficiency and productivity (Ishfaq et al., 2024; Umair et al., 2024). However, despite its significance for economic growth, stability, sustainability, and innovation, GFCF growth in Pakistan has been slower in recent years than in regional economies. For example, the average investment-to-GDP ratio, i.e. gross capital formation as % of GDP, from 2000 to 2024 in Pakistan was 14.58% as compared to 32.0% in South Asian countries, e.g. Bangladesh (28.1%), Sri Lanka (29.3%), Nepal (30.2%), and India (34.0%) (Figure 1). Further, the global investment-to-GDP ratio during the same period was 25.3% (World Bank, 2025).

Figure 1: Investment-to-GDP Ratio Regional Economies (%)



Source: Authors' Elaborations upon data from the World Bank (2025).

The stock of physical capital in an economy is determined by the periodic flows of gross fixed capital formation (GFCF) relating to the construction of buildings (residential & non-residential), structures, machinery & equipment, ICT, and intellectual property products, e.g., R&D, software & databases, and copyrights. In the literature, physical capital has been measured through GFCF, e.g., Ali et al. (2014), Mujahid et al. (2014), Abid et al. (2016), Pomi et al. (2021), Islam et al. (2022), Chishti (2022), and Ishfaq et al (2024). However, the data on gross investment have a limitation, as they do not provide information on depreciation rates and capital stock and, hence, cannot be used to derive estimates of net investment (Batool & Goldmann, 2021). Therefore, many researchers, e.g., Naqvi (2003), Ali & Ramay (2014), Batool & Goldmann (2021), Ali & Akhtar (2024), and Umair et al. (2024) have used the Perpetual Inventory Method (PIM) to estimate the capital stock at the national level.

Further, the UN (2009) and the OECD (2009) recognize capital statistics as an important component of the national accounts and macroeconomic aggregates, as they are essential for productivity analysis. However, official capital stock estimates do not exist in Pakistan, as the Pakistan Bureau of Statistics (PBS), the national statistical agency responsible for compiling and disseminating statistics, publishes only GFCF estimates. The current study has filled the existing gap in the availability of

statistics on capital stock. Our study differs from the existing literature in several ways. First, our study is the first to use a consistent and coherent time series of GFCF, the major determinant of capital stock, from 2000 to 2025, with 2015-16 as the reference year. Prior data were fragmented and non-comparable because they were based on two different base years, i.e., 2005-06 and 2015-16. PBS data is based on SNA's recommendations for measuring GFCF, i.e., intellectual property products such as R&D, software & databases, copyrights, and mineral exploration. Second, the study has enabled the compilation of a series of nominal and real estimates of physical stock for major industries, e.g., agriculture, industrial activities, and services, and for detailed economic activities, e.g., crops, livestock, forestry, fishing, mining, manufacturing, etc., using linear and geometric methods. Third, the statistics on capital stock have subsequently been used to compile estimates of consumption of fixed capital, which, in turn, will enable comparisons of the growth of net value added across various levels of economic activity.

1.1. Purpose and Scope of the Study

The objectives of the research are presented below: -

1. To analyze the trends in flows of nominal and real fixed investments and investment-to-GDP ratios for various industries in the economy of Pakistan

2. To compile nominal and real stock of fixed capital for various industries, using the linear and geometric methods.

3. To compile estimates of consumption of fixed capital for different industries through linear and geometric methods

4. To compile and analyze trends in industry-wise capital-output ratios and growth of nominal and real value added.

The research project has addressed the following research questions: -

RQ.1. How do fixed investments grow over time, and investment-to-GDP ratios vary among different industries in Pakistan?

RQ.2. What is the stock of fixed capital in various industries, and how does it vary by linear and geometric methods?

RQ.3. How does the consumption of fixed capital vary by industry and by linear and geometric methods?

RQ.4. How do the capital-output ratios and value-added growth vary by industry?

1.2. Relevance to Public Policy

Like other developing countries, Pakistan is capital-deficient country, with the lowest investment-to-GDP ratio among regional economies. The study has identified economic activities for future investment. The study has estimated capital stock statistics in nominal and real terms for Pakistan's economy, which is considered a measure of wealth. These capital stock statistics can be used in future studies to compile productivity statistics, paving the way for efficiency analysis across industries. The capital stock statistics have also been used to derive measures of consumption of fixed capital for various industries in nominal and real terms, enabling the compilation of net aggregates for the economy. The improved estimates of consumption of fixed capital will also result in higher value added for public sector industries, including general government, education, and health and social

work, which is compiled as the sum of compensation of employees and consumption of fixed capital. Finally, the availability of estimates of consumption of fixed capital will enable the compilation of income GDP, a missing link in Pakistan's National Statistical System. The study results will help inform evidence-based policy formulation, implementation, and evaluation to improve investment in Pakistan.

The rest of the study is organized as follows. The literature review is presented in Section 2, followed by the research methodology in Section 3. The findings and their discussion are presented in Section 4, whereas the conclusion, policy implications, and directions for future research are reported in Section 5.

LITERATURE REVIEW

2.1. Physical Capital and Economic Growth

Capital stock refers to the "stocks of fixed assets owned and used by producers in the production process and is considered a measure of fixed assets (non-financial assets) within an economy at a point in time" (OECD, 2009). In simple words, capital stock is the accumulated value of GFCF. Many researchers have investigated the association between capital stock and economic growth. For example, Judson (2002) attempted to measure human capital stock along the lines of physical capital. He found that the share of the former rose with increases in GDP, contrary to physical capital. Naqvi (2003) estimated per-worker capital stock in the private and public sectors using PIM from 1965 to 2000 and found equal shares of capital stock in both sectors. The authors also applied VAR to examine differences in the estimates of the long-run elasticities of two types of capital stock.

Ali et al. (2014) applied Johansen cointegration, unit root tests, and Granger causality to examine the effect of foreign capital inflows on domestic investment using time-series data from 1972 to 2013. They found a positive and significant effect of foreign capital inflows on domestic investment. The authors used gross fixed capital formation as a proxy for domestic investment. Ali & Ramay (2014), estimating output and total factor productivity using the Cobb-Douglas production function for time-series data from 1961 to 2013, found that physical capital and labor were significant factors. Mujahid et al. (2014) investigated the impact of human capital investment, i.e., primary, secondary, and tertiary education, and the number of beds and doctors per person, on economic growth and physical capital for the period 1990-2010. Using data from 1981 to 2014, Ali (2015) assessed the impact of gross fixed capital formation in the private and public sectors on economic growth in Pakistan.

Using the Autoregressive Distributed Lag (ARDL) bound testing approach on time-series data from 1970 to 2012, Abid et al. (2016) found positive effects of physical and human capital on output in the agricultural and industrial sectors. However, the effect of human capital on agricultural output was stronger than that of physical capital, whereas the effect of physical capital on industrial output was higher. The authors used GFCF as a proxy for physical capital.

Batool & Goldmann (2021) Used vector error correction models and time-series data from 1973 to 2014 to examine the relationship between investment in transport infrastructure, disaggregated by the private and public sectors, and economic growth. The authors compiled monetary and physical measures of capital stock using the perpetual inventory method, assuming a 5% depreciation rate for transport infrastructure, and examined the causal relationship between infrastructure investment and GDP growth.

Using ARDL bounds tests and data from the IMF's Fiscal Affairs Department spanning 1960 to 2017, Mazher & Dahalan (2021) examined relationships among real GDP, investment, and capital stock in the public and private sectors. The authors found a significant positive association among real GDP, government investment, and private capital stock. However, the study did not describe the sources or methods used to compile the public and private capital stock. Pomi et al. (2021) found positive contributions of both human and physical capital to growth in Bangladesh's economy, with varying efficiencies from 2000 to 2019, using the Vector Autoregression (VAR) model. The authors used fixed capital input as a proxy for physical capital.

Islam et al. (2022) used data from the United Nations Environment Programme's (UNEP) Inclusive Wealth Index (IWI) to compute Pakistan's inclusive wealth, comprising human capital, natural capital, and produced capital, for 1992–2019. Their measure of produced capital was based on investment in produced assets, including ports, buildings, roads, cables, and machinery and equipment. The authors reported positive growth in human capital and produced capital in Pakistan over the study period (Islam et al., 2022). Using the Fully Modified Ordinary Least Squares (FMOLS) technique, Chishti (2022) examined the relationship between economic growth and demographic variables, treating physical capital as a mediating variable from 1960 to 2018. The author used real GFCF as a proxy for physical capital at the national level.

Ishfaq et al. (2024) examined the macroeconomic effects of human, physical, and natural capital formation on economic growth in Pakistan. The authors used time-series data from the World Development Indicators spanning 1971 to 2020. They found that natural capital, human capital, labor force participation rate, physical capital, and financial development are positive and significant determinants of economic growth in Pakistan. The authors used gross capital formation as a proxy for the capital stock. Using the ARDL technique and time-series data from 1990 to 2022, Umair et al. (2024) found that labor, physical capital, and energy consumption contribute positively to output in agriculture and industry in both the short- and long-run. Using time-series data from 1991 to 2021 and applying a growth accounting framework, Ali & Akhtar (2024) found that human and physical capital are positive contributors to Pakistan's economic growth. The authors used PIM to compile a national stock of physical capital.

2.2. Measurement of Physical Capital Stock

Measuring the physical capital stock in an economy is vital because it influences economic growth, technical change, and economic forecasting (Ali & Ramay, 2014). The need for indirect capital stock derivation arises because most capital equipment is used repeatedly in production (Nehro & Dharashwar, 1993). However, measuring capital stock is constrained by factors such as own-account capital formation and the lack of long-term, consistent, and harmonized GFCF data.

According to OECD (2009), the capital stock can be measured in three ways, i.e., i) Survey method, ii) Administrative record, and iii) PIM. In the survey method, businesses in the private and public sectors engaged in various economic activities are asked about the acquisition or historical values of all assets still in use, and the dates of their acquisition. However, the survey method is subject to time constraints. For some asset categories, e.g., road vehicles, maritime shipping, aircraft, and residential and non-residential buildings, administrative records can be used to build a series of capital stock. This method also has limitations due to the lack of timely, relevant data. Due to these limitations, many researchers, e.g., Ali et al. (2014), Mujahid et al. (2014), Abid et al. (2016), Pomi et al. (2021), Islam et al. (2022), Chishti (2022), and Ishfaq et al (2024), have used GFCF as a proxy for capital stock.

The OECD (2009) recommends using PIM to compile estimates of capital stock. The basic idea behind PIM is that the past investment in fixed assets results in the accumulation of capital stock in the current period. However, the availability of assets' useful lives, retirement patterns, age-efficiency, and age-price profiles is an essential requirement for the application of PIM (UN, 2009). Many studies have applied PIM to estimate the stock of physical capital, including, but not limited to, Khan (2006), Ahmad et al. (2008), Ali & Ramay (2014), and Ali & Akhtar (2024).

According to OECD (2009), PIM can be used to compile capital stock in various specifications, i.e., i) linear method, ii) geometric method, iii) Gamma distribution, and iv) Weibull distribution. In the linear method, for a given service life of an asset, its age-price profile declines linearly, and the asset is used up evenly throughout its useful service life. The geometric model is simple to compute as it combines retirement and age-price profiles of assets. (UN) 2009 and OECD (2009) recommend using the geometric model to estimate capital stock and consumption of fixed capital because it is conceptually sound and easy to implement. The Gamma and Weibull distributions are used in statistically advanced economies, e.g., Germany, the US, Australia, New Zealand, Sweden, and the Netherlands.

Among the regional economies, the Central Statistics Office, India, has compiled and published estimates of net capital stock and CFC using PIM since 1981 for the public sector, private corporate sector, and household sector, using a linear model. While the PIM estimates capital stock and changes in capital stock over time, estimates of CFC are obtained as byproducts of the PIM for all fixed assets, i.e., tangible and intangible fixed assets owned by producers (GOI, 2012). In Bangladesh, CFC is estimated using PIM, and aggregate CFC figures are published at current and constant prices to derive aggregate net national income without industry-wise disaggregates (GOB, 2022). Further, estimates of net and gross capital stock are not published at aggregate and industry levels. In Sri Lanka, the current and constant aggregates of CFC are compiled at the national level to derive GDP through an income approach. However, industry-wise estimates of CFC are not published (GOSL, 2022). Further, estimates of net and gross capital stock are not published at aggregate and industry levels.

The current study has used linear and geometric methods to compile statistics on capital stock and fixed capital consumption. The literature review above shows that capital stock statistics have been widely used in studies of economic growth. Declining GFCF flows may lead to a significant reduction in the productive capacity of various industries. However, coherent and consistent estimates of capital stock for various industries are not available in Pakistan. The current study has estimated nominal and real measures of capital stock and consumption of fixed capital separately across industries, paving the way for the compilation of net aggregates of macroeconomic statistics and for productivity analysis. To the best of our knowledge, no other country in the region has compiled and published estimates of capital stock and CFC at the detailed level of economic activities using two models simultaneously, i.e., linear and geometric.

RESEARCH METHODOLOGY

As mentioned earlier, both the UN (2009) and the OECD (2009) recommend using the PIM to estimate capital stock and fixed capital consumption. The compilation of these statistics requires a long-term time series of GFCF by industry type and asset type, to the extent possible, to make the estimates more consistent and reliable. The useful lives of various asset types, price indices, and residual values are the other essential requirements (UN, 2009).

Capital Stock at Constant Prices: The application of the linear model is relatively simple and requires fewer assumptions. For Geometric depreciation, if the value of an asset is X at the time of its purchase, the value of the asset will become $X \times p$ after 1 year of service, and $X \times p^2$ after 2 years of service, and so on. Similarly, it will become $X \times pn\ after\ n$ years of service. Here, p is the geometric parameter with the range of $0 \leq p \geq 1$, the formula for geometric depreciation is as follows:

$$X \times p^L = X \times C \qquad (1)$$

Where p = Geometric parameter, C = cut-off point (e.g., if 15 %, C = 0.15), L = service life of the asset. It can be concluded from the above equation that $p^L = C$, therefore, $p = C^{1/L}$

Deflators: In the PIM, regardless of the model choice (linear vs. geometric), capital stock is first compiled at constant prices and then converted to current prices. This conversion requires a relevant price index for each industry. **The industry-specific implicit deflators** have been derived using the following formula:

$$Price\ index\ (Year_{to} = 100) = \frac{GFCF\ (current\ price)}{GFCF\ (Constant\ Prices)} \times 100 \qquad (2)$$

Net Capital Stock (NCS): The net capital stock (NCS) for the starting period at constant prices is the difference between GFCF at constant prices and the aggregate Consumption of Fixed Capital (CFC). For subsequent periods, the end-of-period NCS at constant prices has been derived by using the following identity:

$$NCS_t\ (constant\ price) = NCS_{t-1} + GFCF_t(constant) - CFC_t \qquad (3)$$

Consumption of Fixed Capital (CFC): Finally, consumption of fixed and NCS at current prices has been derived as under:

$$CFC\ (Current\ Prices) = \frac{CFC\ (constant\ price) \times Price\ Index}{100} \qquad (4)$$

$$NCS\ (Current\ Prices) = \frac{NCS\ (constant\ price) \times Price\ Index}{100} \qquad (5)$$

Valuation of Capital Stock: Another choice in the compilation of capital stock statistics is the valuation. The capital stock can be valued at historic prices, i.e., the prices at which the assets were originally acquired, or at reference-period prices, such as the base year of other macroeconomic aggregates. In the current study, capital stock estimates are valued at the base-year prices of Pakistan's national accounts, i.e., 2015-16.

Depreciation Rates: The industry-specific service life of the asset has been used to determine the depreciation rates for the Linear Method. However, for the Geometric method, the asset's residual values have also been used to derive the depreciation functions. While capital stock has traditionally

been estimated using a linear method for its simplicity, the UN (2009) and OECD (2009) recommend using the geometric model to estimate capital stock and consumption of fixed capital because they are conceptually correct, easy to implement, and provide a more accurate economic representation of asset decay. Therefore, this study has employed both methods to derive the capital stock estimates.

Initial Capital Stock: The positive depreciation rates of capital and the availability of an investment series over a very long time span make the initial capital stock rather unimportant (Chen & Plotnikova, 2014).

i) Use of accounting data: Firm-level data sets contain book values of capital goods (KVB). Thus, the simple solution to the missing initial values' problem is to directly use book values of capital in the period s for initializing the PIM, i.e., Kis = (KVB)
Despite being a simple solution to the problem of initial capital stock, book values have a drawback: they do not reflect firms' productive capital stocks because age-efficiency profiles are not accounted for (Chen & Plotnikova, 2014).

ii) Steady State Approach: According to Berlemann & Wesselhöft (2012), the first approach of estimating the initial capital stock is based on Harberger (1978). While employing neoclassical growth theory, this approach assumes the economy is at its steady state. The information on the current level of investments, the depreciation rate, and the growth rate of output is sufficient to calculate the capital stock in the preceding period as follows:
$K_{t-1} = \frac{I_t}{g_{GDP}+\delta}$ (7)
However, this approach too has a drawback: the estimate of the initial capital stock depends crucially on investments and the growth rate of output, either for a single year or for three-year averages, as used by Harberger (1978) (Berlemann & Wesselhöft, 2012).

iii) Disequilibrium Approach: Introduced by Griliches (1980) and modified by De la Fuente & Doménech (2006), this approach is also based on the neoclassical growth model, and using the growth rate of investment instead of output, it can be written as:
$K_{t-1} = \frac{I_t}{g_I+\delta}$ (8)
Like the Steady State Approach, the Disequilibrium Approach also relies heavily on the investment and its growth rate for a single year or the average of a few years (Berlemann & Jan-Erik, 2012).

iv) Synthetic Time Series Approach: Introduced by Jacob et al. (1997) and modified by Kamps (2006), this approach recommends constructing an artificial, historical time series of investments (Berlemann & Wesselhöft, 2012). Kamps (2006) assumed a constant annual investment growth rate of 4 percent. The current study has used a modified Synthetic Time Series Approach but relies on actual historic time series of investments following the literature, e.g., IMF (2017).

Data Collection Methodology: A mixed-methods approach has been adopted. The series of GFCF has been obtained from secondary sources, i.e., the Ministry of Finance, the Pakistan Bureau of Statistics, and the State Bank of Pakistan. However, owing to the non-availability of relevant and indispensable information on average asset lives in various industries and their residual values (retirement patterns), primary data through questionnaires has been collected from various cities. Annual reports of companies have also been used to extract the relevant information.

Sampling and Sample Size: Data on useful asset lives and residual values have been collected from 520 companies across various cities, with appropriate industrial representation from four provinces, including the federal capital. Annual reports of companies have also been used to extract the relevant

information. Research Assistants have collected data under the supervision of P.I./Co-P.I. Companies from various industries have been selected using purposive and convenience sampling techniques.

Potential Data Quality Issues: The quality of the collected data has been assessed through quantitative measures, including ranges, averages, and standard deviation. Further, all aggregates have been estimated at current and constant prices. The missing information has been estimated through interpolation and extrapolation techniques.

FINDINGS AND DISCUSSION

This study has two objectives, i.e., i) to analyze sector-specific flows of investment and ii) to estimate the stock of fixed capital for various industries in the economy of Pakistan. The findings relating to these two areas are discussed in turn.

4.1. Analysis of Sector-Specific Flows in Fixed Investment

The United Nations' System of National Accounts recommends measuring investment in an economy through GFCF, as it reflects the capital invested in assets used to produce goods and services over more than one year. GFCF includes the acquisition of produced assets, such as residential and non-residential buildings, structures like roads, bridges, highways, dams, and ports, fixed assets produced for own use (commonly known as own-account capital formation), disposal of fixed assets, and additions and improvements to land, which are non-produced assets (UN, 2009). GFCF is a flow variable that responds to national and international economic and political factors, such as interest rates, financing availability, legal frameworks, international commodity prices, price stability, energy availability and prices, and political stability, and it exhibits wider period-to-period variations. These variations are captured in the actual growth rate of fixed investment and also affect investment-to-GDP ratios at the industry and aggregate levels. In Pakistan, PBS compiles GFCF data for various industries, both in nominal and real terms, from 2000 to 2025 on a 2015-16 base. This study uses real GFCF data to analyze the direction of changes over time (Appendix I) vis-à-vis changes in real value added (GVA) across industries (Appendix II). The study also calculates the activity-wise real investment-to-GDP ratio (IGR) (Appendix III). The IGR is measured as the ratio of real GFCF to real gross value added.

Descriptive statistics for GVA, GFCF, and IGR across detailed economic activities, major industries, and the overall economy are presented in Table 1. The results show that the average growth of real value added and GFCF in Pakistan during the study period was 3.9% and 2.8%, respectively, while the average IGR was 14.6% (Table 1, Figure 2). Pakistan's investment-to-GDP ratio lags behind the regional average of 32.0% and the neighboring countries of India (34.0%) and Bangladesh (28.1%). This is also one of the factors contributing to Pakistan's slower average economic growth rate between 2000 and 2024, i.e., 3.9%, compared with the regional average of 6.1%, India (6.3%), and Bangladesh (6.0%) (World Bank, 2025). The average investment-to-GDP ratios for agriculture, industry, and services from 2000 to 2025 were 12.4%, 17.8%, and 14.6%, respectively. Furthermore, the average growth in fixed investment for these major industries during the same period was 2.4%, 0.8%, and 4.5%, respectively (Table 1, Figure 2).

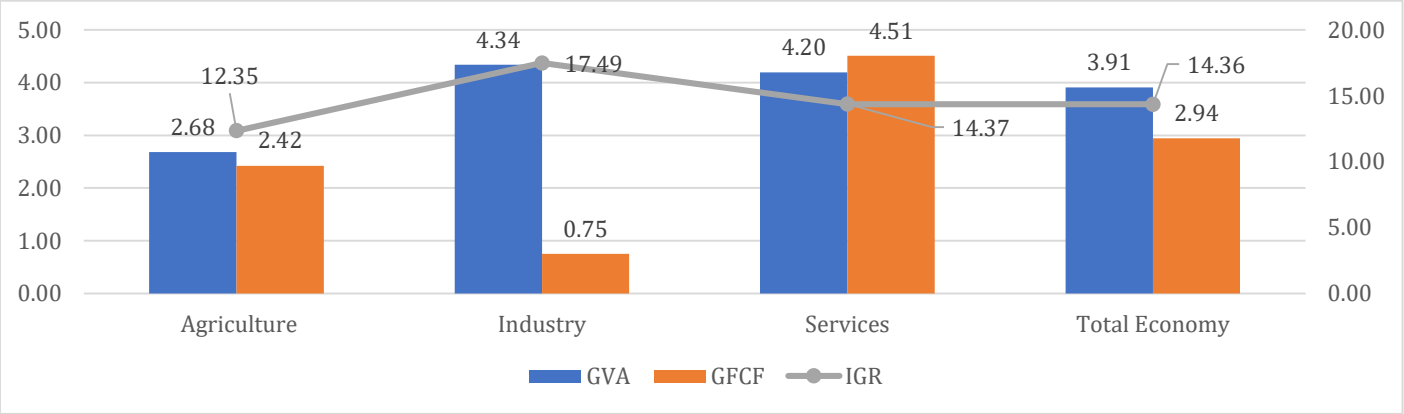
Table 1: Descriptive Statistics

Industries	GVA			GFCF			IGR		
	Mean	**St.Dev**	**C.V.**	**Mean**	**St.Dev**	**C.V.**	**Mean**	**St.Dev**	**C.V.**
Agriculture	**2.7**	**1.7**	**63.5**	**2.4**	**2.4**	**101.0**	**12.4**	**0.4**	**2.9**
Crops	1.6	4.9	300.6	0.9	10.3	1094.1	7.3	0.8	10.7
Livestock	3.7	0.9	24.6	3.1	0.7	21.3	15.6	0.6	4.0
Forestry	0.6	9.4	1580.9	2.2	0.0	1.0	0.7	0.2	24.4
Fishing	1.2	6.5	556.0	0.6	1.2	196.4	32.6	3.3	10.3
Industry	**4.3**	**4.9**	**113.6**	**0.8**	**13.8**	**1830.6**	**17.8**	**5.5**	**31.2**
Mining and quarrying	1.9	6.4	336.2	6.3	48.4	773.6	15.0	10.3	68.6
Manufacturing									

i. Large Scale	4.6	7.3	156.4	0.4	18.7	5096.7	20.6	8.3	40.4
ii. Small Scale (including Slaughtering)	7.0	1.1	16.0	5.4	9.2	170.9	10.2	1.7	17.0
Electricity, gas, and water supply	4.8	18.0	372.0	5.9	34.5	583.5	29.8	9.5	31.9
Construction	4.1	9.2	224.0	6.9	38.6	555.7	6.7	2.6	38.9
Services	**4.4**	**2.3**	**51.8**	**4.5**	**11.8**	**261.7**	**14.6**	**2.4**	**16.5**
Wholesale and retail trade	4.0	4.5	111.6	4.6	13.9	300.0	3.7	0.6	17.4
Accommodation and food service activities (Hotels and Restaurants)	5.8	2.4	41.4	8.0	50.3	627.2	1.9	0.6	32.1
Transportation and storage	3.7	3.2	86.1	2.9	24.5	845.3	95.5	36.6	38.3
Information and communication	11.0	10.6	95.7	12.2	57.4	471.6	55.6	51.9	93.3
Financial and insurance activities	4.3	7.8	181.7	4.7	17.0	358.0	10.6	1.8	17.4
Real estate activities (Ownership of Dwellings)	3.8	0.3	8.3	3.9	0.2	4.2	30.2	0.2	0.8
Public Administration and Social Security (General Government)	3.5	6.3	180.9	8.8	21.3	241.5	42.2	12.0	28.5
Education	5.4	5.3	97.6	4.1	9.7	235.5	18.5	2.9	15.5
Human health and social work activities	7.5	5.4	71.4	6.6	20.0	304.9	29.8	10.8	36.5
Other Private Services	5.7	1.3	23.4	5.0	3.3	65.5	7.9	0.5	6.2
Total Economy	**3.9**	**2.1**	**54.4**	**2.9**	**8.5**	**289.2**	**14.6**	**2.1**	**14.3**

Notes: GVA= Growth in Real Gross Value Added (%), GFCF = Growth in Real Gross Fixed Capital Formation (%), IGR = Real Investment-to-GDP Ratio.
Source: Author's Elaborations upon data from GOP (2025).

Figure 2: Average Growth Rates of Main Variables between 2000 and 2025 by Major Industries



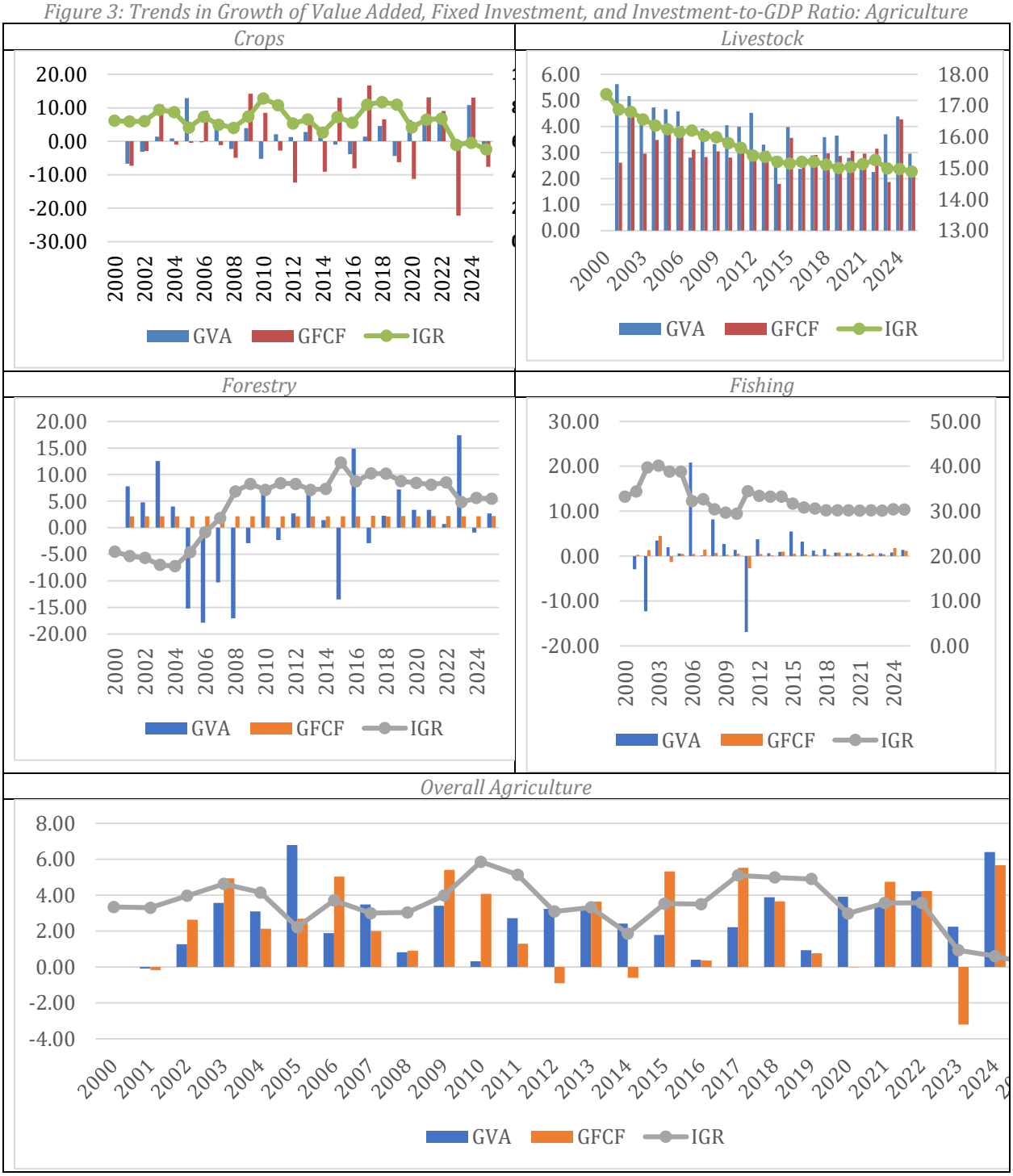
Source: Author's Elaborations upon data from GOP 2025).

4.1.1. Agriculture

The trend analysis of value added, fixed investment, and investment-to-GDP ratio for various components of agriculture, i.e., crops, livestock, forestry, and fishing, is presented in Figure 3. For most periods, the direction of change in value added and investment for crops is the same. The minimum growth in value added and investment for crops was observed in 2025 and 2023, respectively. The IGR was also lowest during 2023 at 5.79% and highest during 2010 at 8.57%. The livestock industry witnessed steady GFCF growth of 3% during the study period, while IGR declined from 17.4% in 2000 to 14.6% in 2025. The real GFCF growth in forestry remained around 2%, while IGR ranged from 0.4% in 2004 to 0.8% in 2025, after reaching 1% in 2015. While GFCF growth in

fishing ranged from -2.7% to 4.5%, the IGR remained above 30% throughout the study period. The real GFCF grew at an average rate of 2.4%, with a low of -3.2% in 2023. The IGR for agriculture ranges from 11.6% to 13.0% (Figure 3).

Figure 3: Trends in Growth of Value Added, Fixed Investment, and Investment-to-GDP Ratio: Agriculture

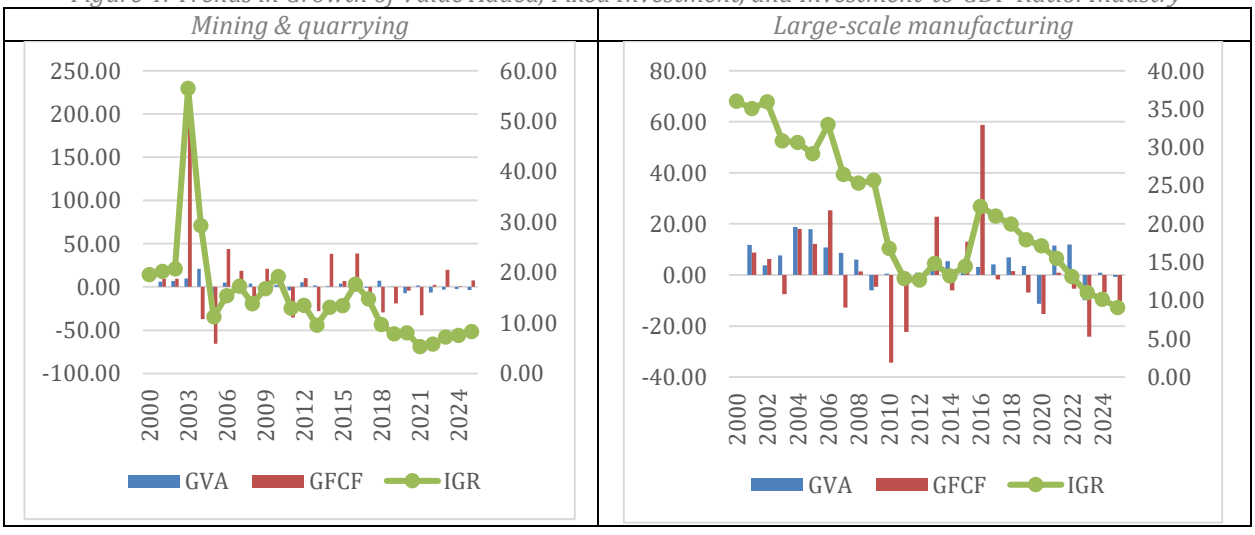


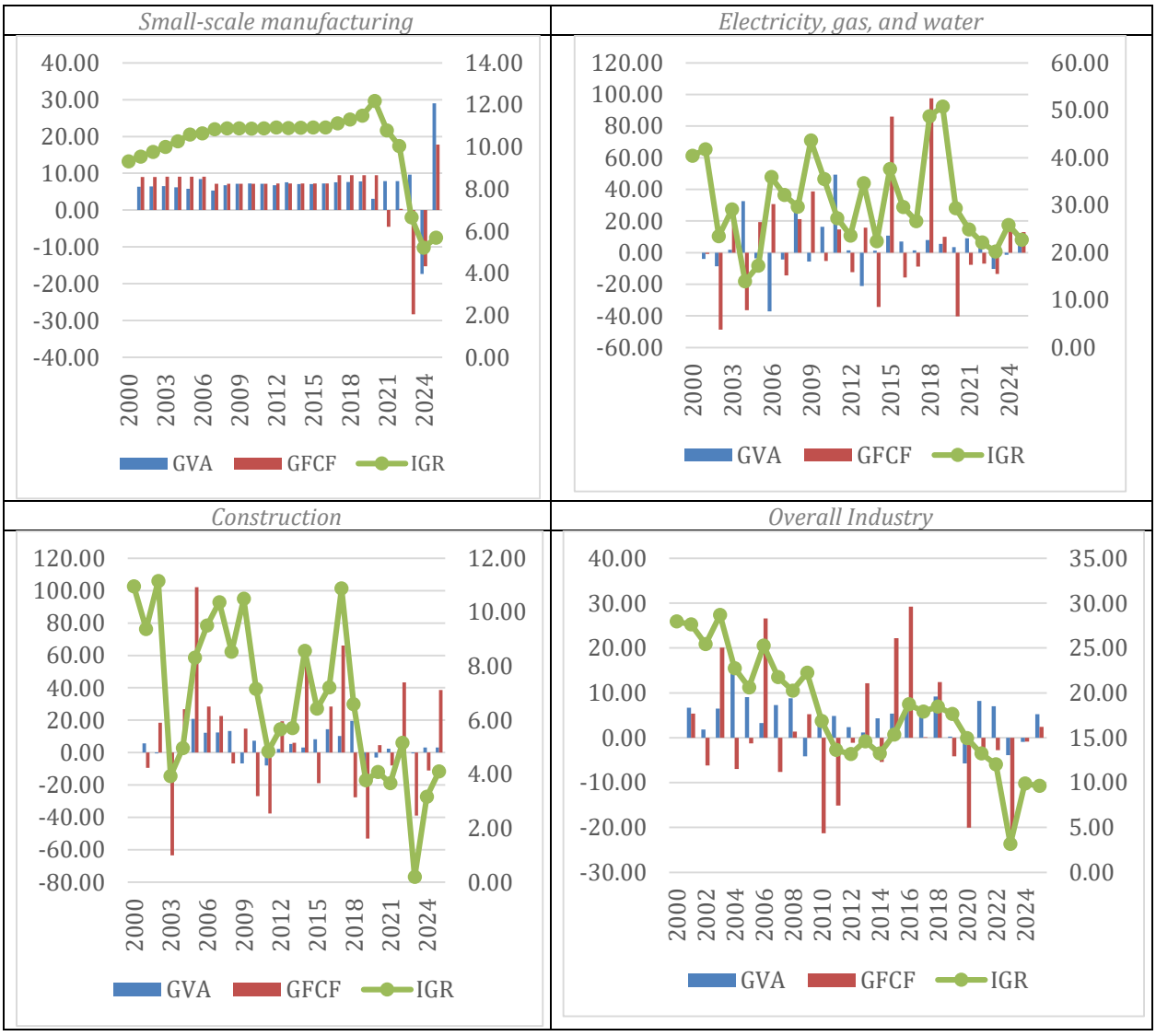
Source: Author's Elaborations upon data from GOP (2025).

4.1.2. Industry

The trend analysis of value added, fixed investment, and investment-to-GDP ratio for industrial activities is presented in Figure 4. Both value added and investment flows observed wider variation in the mining and quarrying industry during 2000 and 2025. The real GFCF grew by 199% in 2003, resulting in the highest IGR of 56.5%, but fell to 2.3% the following year and remained above 10% through 2017. However, the IGR declined sharply after 2018, reaching a low of 5.32% in 2021. Large-scale manufacturing (LSM) is considered a capital-intensive industry that establishes vital backward and forward links with agriculture and services. For the study period, the real GFCF in LSM has posted meager growth of 0.4%, with an average contraction of 9.8% during 2019 and 2025. The IGR was 36.0% in 2000 but subsequently declined to 13% by 2014. It increased to 22.3% in 2016 but began declining again, reaching its minimum of 9.2% in 2025. The declining IGR may have serious implications for the LSM industry's productive capacity, innovation, adaptability, and export competitiveness. The small-scale manufacturing (SSM), despite its importance for employment generation, food security, export potential, and the provision of raw materials to LSM, is estimated using fixed growth rates due to data limitations. For most of the study period, the real GFCF in SSM remained on a positive trajectory, resulting in double-digit IGR, but, like LSM, it also showed an average negative growth rate of 8.8%, which caused IGR to decline to just 5% during 2025. Electricity, gas, and water are among the industries witnessing wider variations in all three variables, i.e., GVA, GFCF, and IGR, as is visible in Figure 4 (Part d). With meagre average GFCF growth of 5.2%, the industry witnessed the lowest growth of -48.7% in 2002 and the highest growth of 97.6% in 2018, generating wider fluctuations in ICR from 14.0% in 2002 to 50.8% in 2019, while the average IGR remained around 30.0%. The average growth in real GFCF for construction remained 7.7%, whereas the average IGR was 6.7%, ranging from 3.2% in 2024 to 11.2% in 2002. The declining IDR over recent years, averaging 4.3% between 2018 and 2025, may hamper the construction industry's future growth prospects. For overall industrial activities, the decline in real GFCF and IGR in recent years, i.e.,- 8.2% and 12.4% between 2019 and 2025, is a worrying sign for the future growth prospects of the industrial sector in the country (Figure 4).

Figure 4: Trends in Growth of Value Added, Fixed Investment, and Investment-to-GDP Ratio: Industry





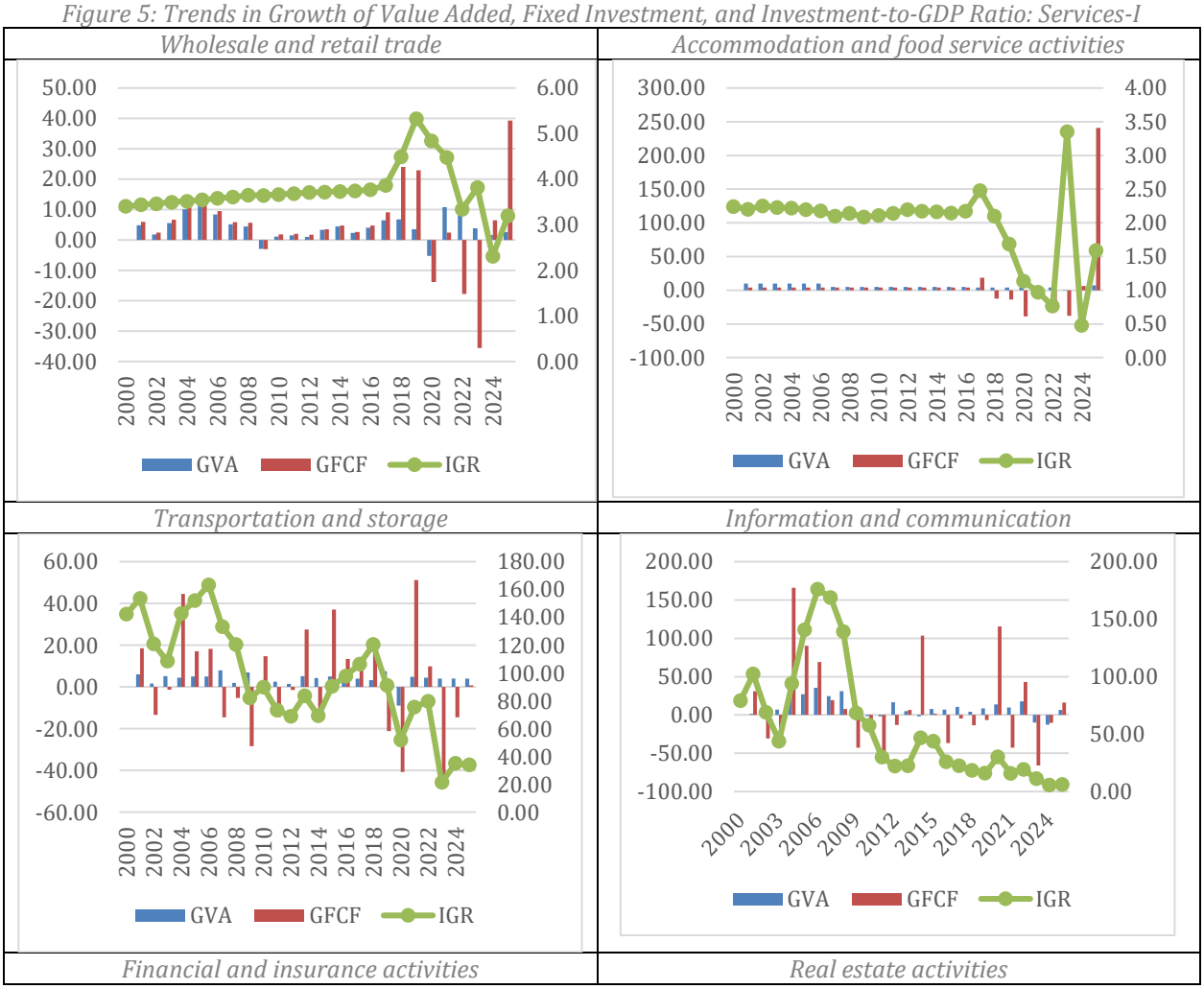
Source: Author's Elaborations upon data from GOP (2025).

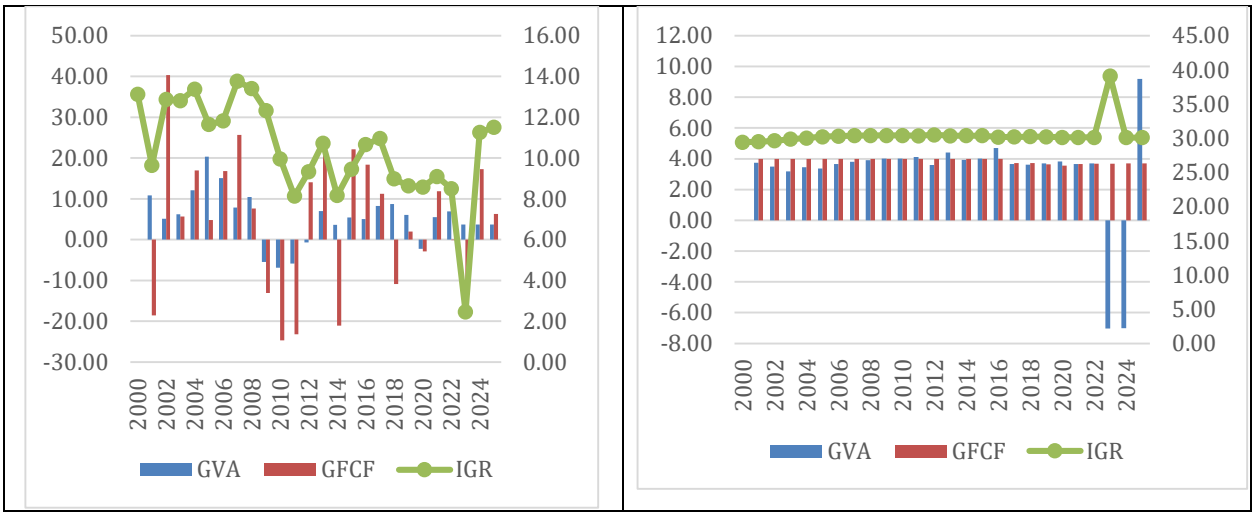
4.1.3. Services

The trend analysis of value added, fixed investment, and investment-to-GDP ratio for services, including wholesale and retail trade, accommodation and food service activities, transportation and storage, information and communication, financial and insurance, and real estate activities, is presented in Figure 5. The growth in GFCF and IGR for wholesale and retail trade and accommodation and food service activities follows a similar pattern over time, with average values of 4.6% and 3.9%, and 7.1% and 1.9%, respectively. The overall average growth in GFCF for the study period in transportation and storage was positive at 2.9%. However, the industry has witnessed an average contraction of 8.5% during recent years, i.e., from 2019 to 2025. The successive decline in GFCF has led to a decline in IGR from a peak of 163.4% in 2006 to 34% in 2025. The IGR remained consistently above 100% from 2000 to 2008, predominantly due to a higher number of vehicle sales, encouraged by commercial banks' car financing schemes, but witnessed a continuous decline up to 2014 (69%). However, it started improving again in 2015, reaching 120.4% in 2018, but has been declining since then, reaching its minimum of 34% in 2025. Like transportation and storage, the

information and communication industry also witnessed higher GFCF growth (average of 40.1%) and a subsequent increase in IGR from 79.2% in 2000 to 139.1% in 2008, mainly due to heavy investment in the telecom sector. However, successive declines in GFCF in the following years have brought the IGR down to just 5.8% in 2025. The financial and insurance activities have witnessed a modest average real GFCF growth of 4.6%, with IGR ranging from 8.1% to 13.8% during the study period. Due to the application of fixed growth rates in GFCF estimation, the real estate industry has expanded at 4%, while IGR has moved within a narrow range of 29.5% to 30.5% (Figure 5).

Figure 5: Trends in Growth of Value Added, Fixed Investment, and Investment-to-GDP Ratio: Services-I





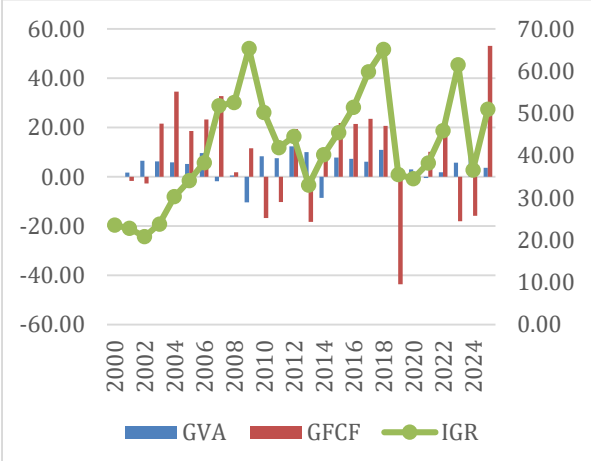
Source: Author's Elaborations upon data from GOP (2025).

The trend analysis of value added, fixed investment, and the investment-to-GDP ratio for the remaining components, e.g., public administration and social security, education, human health & social work, and other private services, is presented in Figure 6. The GFCF in public administration and social security has grown at an average rate of 8.1%, with a minimum of -43.6% in 2019 and a maximum of 36.3% in 2025. The average IGR is 41.9%, with minimum and maximum values of 20.8% and 65.4% during 2002 and 2009, respectively. Both education and human health and social work follow the same pattern of growth in GFCF and exhibit minimum and maximum IGR values in 2024 and 2008, respectively. Finally, the application of fixed growth for real GFCF has resulted in stable IGR for other private services, with an average of 7.9%, ranging from 6.8% to 8.5% (Figure 6).

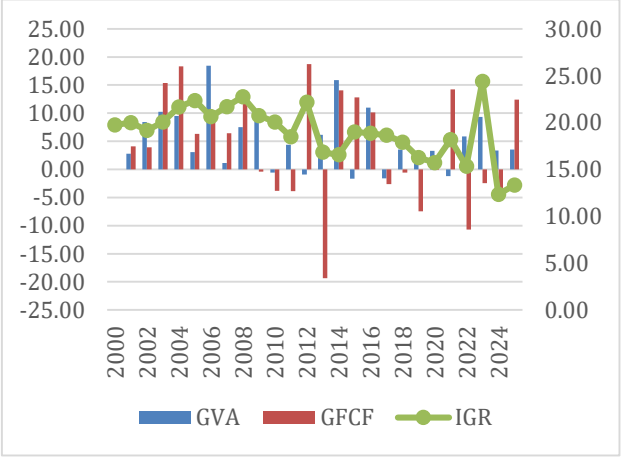
The trend analysis of value added, fixed investment, and investment-to-GDP ratio for overall services is presented in Part (k), Figure 6. While the real growth rate of GFCF in services ranged from -19.2% in 2023 to 25.9% in 2004, the IGR ranged from 10.0% in 2024 to 19.3% in 2008, with an average of 14.6% (Figure 6).

Figure 6: Trends in Growth of Value Added, Fixed Investment, and Investment-to-GDP Ratio: Services-II

Public Administration and Social Security (General Government)

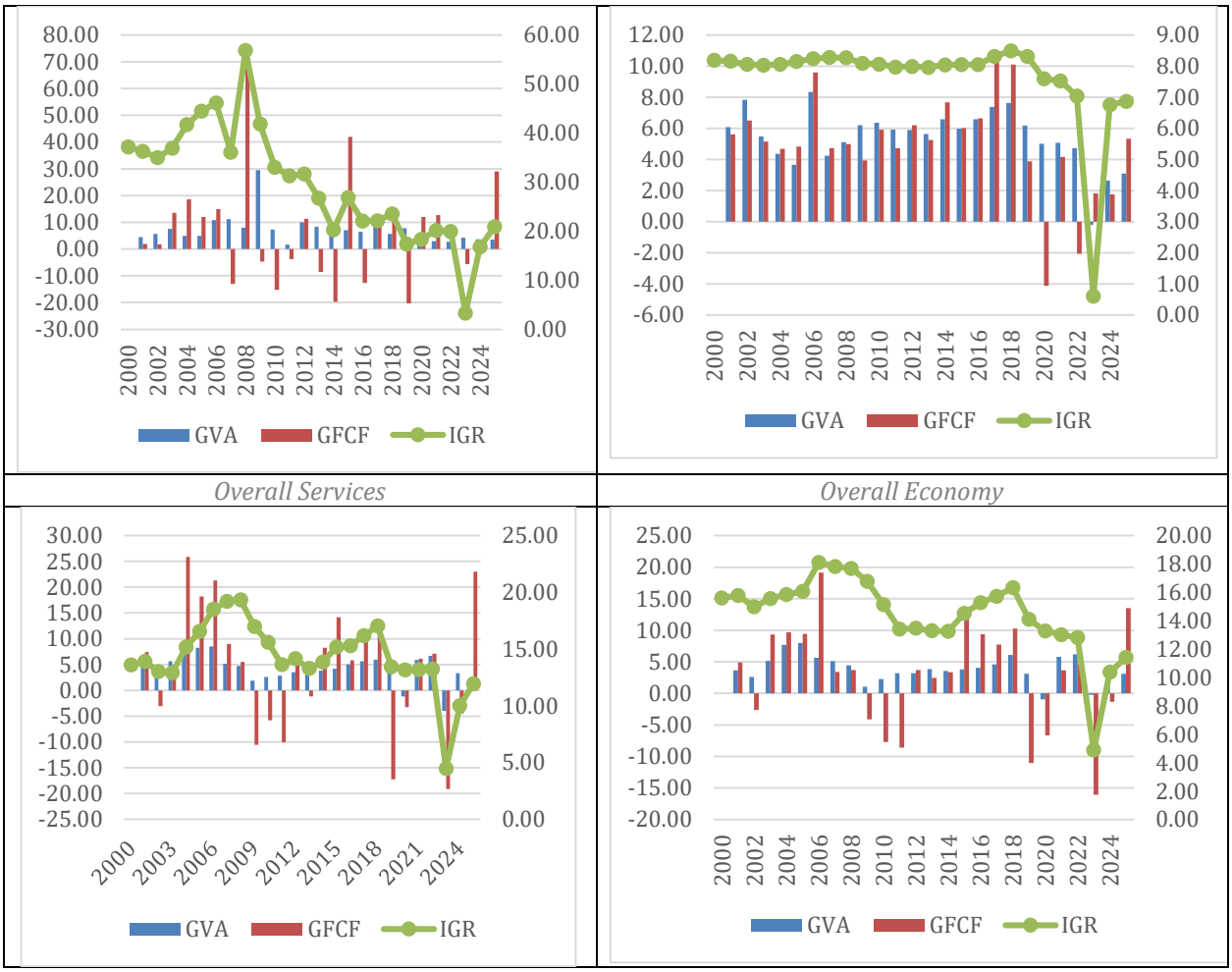


Education



Human health and social work activities

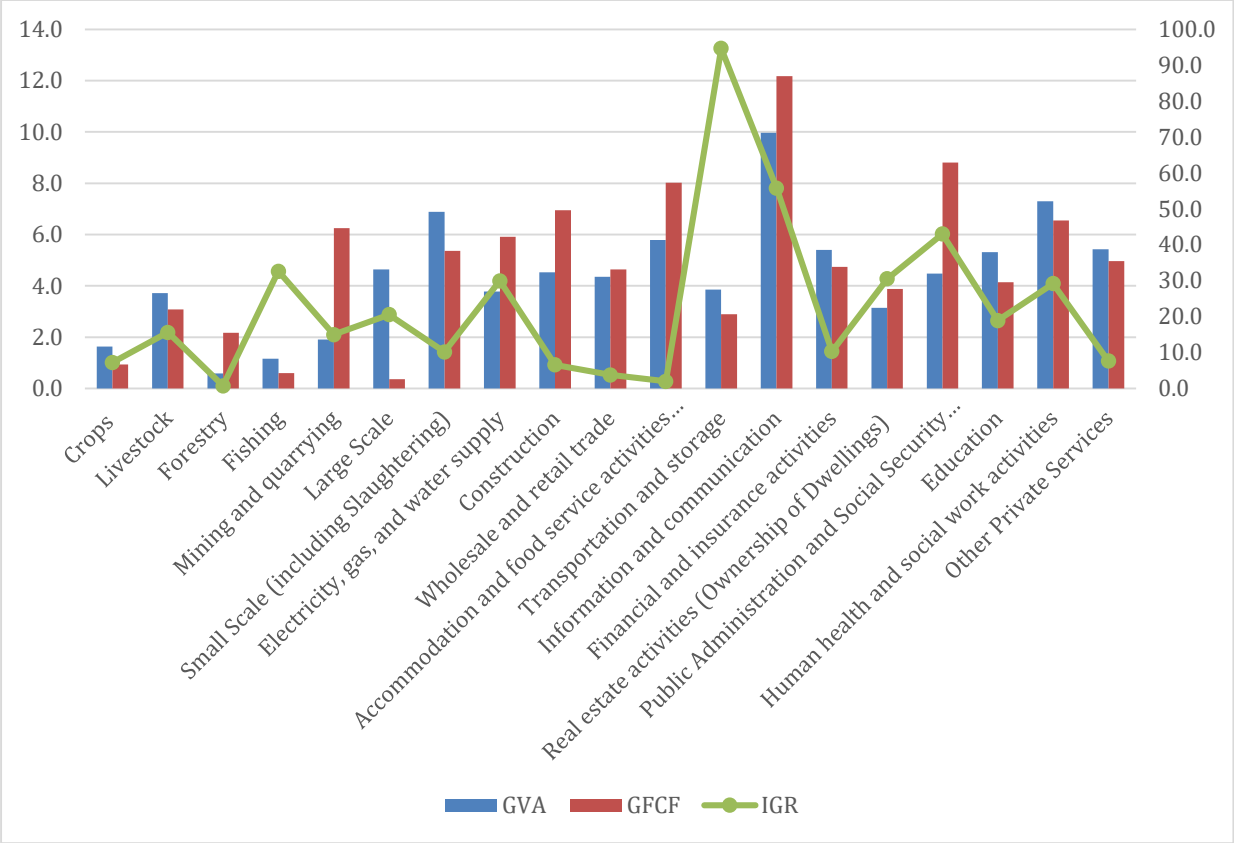
Other Private Services



Source: Author's Elaborations upon data from GOP (2025).

To facilitate sharp comparisons across all detailed economic activities, the average growth rates of value added, GFCF, and IGR between 2000 and 2025 are presented in Figure 7. The highest average growth in GFCF (12.0%) during the study period was in the information and communication industry, followed by public administration and social security (8.1%), construction (7.7%), accommodation and food service activities (7.1%), and 6% each in mining and quarrying and human health and social work activities (Figure 7).

Figure 7: Average Growth (%) Rates between 2000 and 2025 by Economic Activities



Source: Author's Elaborations upon data from GOP (2025).

4.2. Measuring Stock of Physical Capital in Pakistan

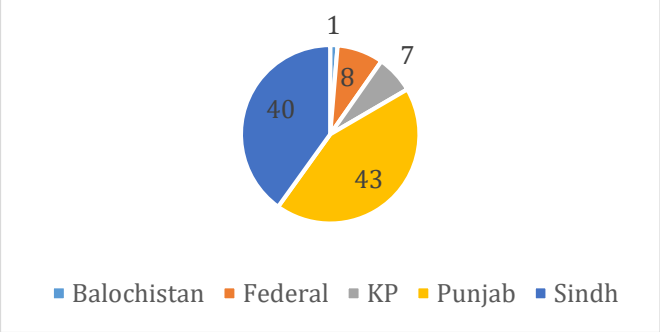
The measurement of the stock of physical capital for detailed economic activities, using linear and geometric methods in nominal and real terms, is the second major objective of the study. As mentioned in the methodology section (equation 1), the estimation of physical capital stock requires GFCF, the average life of various asset categories, and their residual (scrap) values. While secondary data on GFCF at current and constant prices have been collected from 1980-81 onwards, the study team collected primary data through a survey designed to gather information on average asset lifespans and residual values. The data collection instrument/questionnaire *(Appendix IV)*, instructions for data collection, and the coding scheme (Appendix V) have been finalized with the help of the study Mentors. The summary of data collected by province and economic activity is presented in Table 2 and Figure 8, and in Table 3, respectively. 524 responses have been received, of which 43% pertain to Punjab province, followed by 40% in Sindh, 8% for the Islamabad Capital Territory (ICT), 7% from KP, and 1% each for Balochistan. (Table 2, Figure 8).

Table 2: Data Collection Status by Province

Province	Response
Balochistan	7
Federal	44
KP	36
Punjab	227
Sindh	210
Total	524

Source: Authors' calculations.

Figure 8: Data Collection Status by Province (%)



Source: Authors' calculations.

The status of data collection for economic activities is presented in Table 3. According to the available data, majority of the responses i.e. 56.3% pertain to Manufacturing Industry, followed by Financial and Insurance Industry 18.8%, Wholesale and Retail Trade 9.4%, Other Service Activities 2.9%, Accommodation and Food Services 2.3%, Information and Communication 1.7%, Electricity, Gas and Water 1.7, Livestock 1.2%, Transport & Storage 1.2%, Real Estate Activities 1.0%, Construction 1.0%, Crops 0.8%, Education 0.8%, Human Health and Social Work 0.8% and Mining & Quarrying 0.2% (Table 3). Despite making all-out efforts, the response from some industries remained low, mainly due to the informal nature of businesses, a lack of proper documentation, overall reluctance to share financial data, and the relatively technical nature of the subject matter.

Table 3: Data Collection Status by Economic Activities

Industries	**%age Share**
1-Crops	0.8
2-LiveStock	1.2
3-Mining & Quarrying	0.2
4-Manufacturing	56.3
5-Electricity, Gas, and Water	1.7
6-Construction	1.0
7-Whole Sale and Retail Trade (WRT)	9.4
8-Accommodation & Food Services	2.3
9-Transportation & Storage	1.2
10-Information & Communication	1.7
11-Financial and Insurance Services (FIS)	18.8
12-Real Estate Activities	1.0
13-Education	0.8
14-Human Health &Social Work Activities	0.8
18-Other Service Activities	2.9
Total	**100**

Source: Authors' calculations.

The weighted-average life of broad asset categories by industry, calculated from available data, is presented in Table 4. Weights have been developed based on GFCF 2015-16. The highest weighted average life, i.e., 46 years, has been reported for Building and Structures for real estate activities (ownership of dwellings), followed by 45 years for other private services, 40 years for Public Administration, usually termed as general government, 39 years for Electricity, gas & water, 38 years for fishing, and 32 years for crops. For cotton ginning and forestry, the average weighted life of buildings and structures is about 29 years; 27 years for education; 26 years for wholesale and retail; 25 years for construction; 24 years for finance and insurance; 23 years for health and social work; and 22 years for transport and storage. For the remaining industries, the weighted-average life ranges from 10 to 18 years. (Table 4). Similarly, for other assets, including machinery & equipment and intellectual property products (IPPs), the highest weighted-average life is 16 years for crops, followed by 15 years for public administration and 11 years for livestock. For the remaining industries, the weighted-average life of other assets is around 5 to 10 years. Details are in Table 4.

Table 4: Weighted Asset Lives and Residual Values by Industries and Broad Asset Categories

S.No.	Industry	**Weighted Average Life (Year)**		**Weighted Residual Value (%)**	
		Buildings & Structures	Other Assets (M&E, IPPs)	Buildings & Structures	Other Assets (M&E, IPPs)
	Agriculture, forestry, and fishing				
1	Crops	32	16	8.5	18.9
2	Cotton Ginning	29	10	11.5	16.5
3	Livestock		11		25
4	Forestry	29	10	11	18.5
5	Fishing	38	10	8	16.5
6	Mining	10	6	9.2	10.1
7	Large Scale Manufacturing	16	8	16.5	21.5
8	Small Scale including slaughtering	16	10	11.9	19.5
9	Electricity, Gas & Water	39	7	13.8	18.6
10	Construction	25	6	12.3	17.7
11	Wholesale and Retail	26	7	9.5	18.5
12	Accommodation & Food Services (Hot & Rest.)	18	6	10.4	17.9
13	Transport & Storage	22	7	9	19.4
14	Information & Communication	18	6	10.5	17.8
15	Finance & Insurance	24	6	11	24.1
16	Real estate (Housing)	46	5	10	24.7
17	Public Admin (Govt.)	40	15	8.5	14.4
18	Education	27	5	9.5	18.2
19	Health & Social work	23	6	9.4	14.8
20	Other Private Services	45	7	10	19.0
	National Average	30	8	10.3	18.3

Note: GFCF for 2015-16 has been used as weights.
Source: Authors' calculations.

It is worth mentioning that the information on residual (scrap) values was not available in the online sources used for data collection. Therefore, collecting primary data was imperative to obtain the desired information from various establishments engaged in different economic activities. To achieve this end, a survey was designed, the details of which have been explained in the preceding paragraphs. The industry wise analysis reveals that the highest average weighted residual value of buildings of structures is 16.5% of the purchase value for large scale manufacturing industries,

followed by 13.8% for Electricity, gas and water, 12.3% for construction, 11.9% for small scale manufacturing including slaughtering establishments, 11.5% for cotton ginning, 11% for forestry and finance & insurance, 10.5% for information and communication and 10.4% for accommodation services usually termed as hotels and restaurants. For the remaining industries, the residual value for buildings and structures is either 10% or less than 10% of the purchase value of the assets. Similarly, for other assets, which includes machinery & equipment and intellectual property products (IPPs) the highest residual value is 25% of the purchase value of the asset followed by 24.7% for real estate, 24.1% for finance and insurance, 21.5% for large scale manufacturing, 19.5% for small scale manufacturing industries and 19.4% for transport and storage industry. For the remaining industries, the residual value ranges from 14.4% to 19% of the asset's purchase value. Details are in Table 4.

4.3. Industry Specific Capital Stock

Industry-specific capital stock has been compiled using both linear and geometric methods. It is worth noting that linear and geometric methods provide different dimensions of the stock of fixed assets. While the former represents productive capacity, the latter is attributed to ***economic wealth.*** Further, the geometric method results in lower capital stock in the initial years because of higher depreciation rates, leading to wider variations in the absolute values of stock estimates. However, smaller variations are observed in the long-run growth rate of stock. In both methods, four indicators, namely Consumption of fixed capital at current prices, net capital stock at current prices, consumption of fixed capital at constant prices, and net capital stock at constant prices, have been estimated for all the industries along with aggregates for agriculture, industry, services, and overall economy from 1999-00 to 2024-25. Table 5 presents the summary results for the capital stock in agriculture.

Table 5: Capital Stock Summary Results: Agriculture

Year	Linear Method					Geometric Method				
	CFC Current	NCS Current	CFC Constant (2015-16 =100)	NCS Constant (2015-16=100)	NCS Constant Growth (%)	CFC Current	NCS Current	CFC Constant (2015-16 =100)	NCS Constant (2015-16=100)	NCS Constant Growth (%)
1999-2000	169,426	1,301,552	602,739	4,078,147		175,662	1,185,204	618,566	3,867,303	
2000-01	171,299	1,328,640	600,938	4,095,163	0.42	176,887	1,203,397	615,643	3,869,615	0.06
2001-02	177,396	1,399,510	601,739	4,127,642	0.79	181,160	1,259,471	608,070	3,895,763	0.68
2002-03	181,390	1,421,361	608,289	4,184,817	1.39	185,981	1,279,834	619,373	3,941,853	1.18
2003-04	200,920	1,575,321	614,388	4,250,027	1.56	207,332	1,415,243	632,035	3,989,417	1.21
2004-05	223,245	1,743,016	619,894	4,328,013	1.83	234,639	1,562,403	652,584	4,034,713	1.14
2005-06	234,619	1,824,218	623,264	4,437,715	2.53	245,528	1,639,352	654,197	4,113,481	1.95
2006-07	252,659	1,964,802	631,031	4,554,283	2.63	250,130	1,778,348	622,564	4,238,516	3.04
2007-08	290,960	2,221,991	655,019	4,653,662	2.18	285,287	2,021,827	639,969	4,352,946	2.7
2008-09	346,055	2,568,430	680,841	4,768,000	2.46	345,994	2,354,559	680,080	4,468,045	2.64
2009-10	393,837	2,851,254	700,434	4,895,102	2.67	393,208	2,642,119	698,518	4,597,063	2.89
2010-11	477,387	2,991,772	720,426	4,438,742	-9.32	475,271	2,755,483	716,675	4,144,455	-9.85

2011-12	591,325	3,674,521	739,735	4,529,621	2.05	585,936	3,400,626	732,838	4,242,231	2.36
2012-13	659,351	4,053,750	759,950	4,630,456	2.23	652,497	3,781,503	751,985	4,351,030	2.56
2013-14	711,623	4,340,662	778,811	4,707,173	1.66	706,591	4,057,286	773,086	4,433,472	1.89
2014-15	783,850	4,742,307	797,600	4,810,624	2.2	779,690	4,465,452	793,273	4,541,251	2.43
2015-16	815,172	4,899,702	815,172	4,899,702	1.85	810,413	4,635,088	810,413	4,635,088	2.07
2016-17	844,873	5,091,666	834,832	5,018,990	2.43	840,388	4,818,443	830,356	4,758,852	2.67
2017-18	909,323	5,472,557	855,892	5,152,082	2.65	907,073	5,199,328	853,784	4,894,054	2.84
2018-19	1,001,000	6,031,419	875,994	5,272,610	2.34	998,713	5,733,944	873,952	5,016,624	2.5
2019-20	1,126,507	6,800,335	895,289	5,373,801	1.92	1,122,435	6,452,317	891,888	5,121,215	2.08
2020-21	1,338,447	8,069,130	916,844	5,500,726	2.36	1,337,207	7,671,848	915,767	5,249,218	2.5
2021-22	1,576,092	9,569,873	939,464	5,649,159	2.7	1,576,416	9,078,880	939,143	5,397,972	2.83
2022-23	1,975,449	12,795,829	871,527	5,551,714	-1.72	1,896,043	11,954,569	835,985	5,335,972	-1.15
2023-24	2,217,534	16,338,125	802,403	5,845,177	5.29	2,065,598	15,388,692	747,139	5,686,413	6.57
2024-25	2,210,801	18,774,969	731,320	6,207,765	6.2	2,026,125	18,040,108	670,798	6,112,515	7.49

Notes: CFC= Consumption of Fixed Capital, NCS= Net Capital Stock.
Source: Authors' calculations.

Analysis of Table 5 reveals that the growth rate of net capital stock at constant prices is slightly higher under the geometric method than under the linear method. However, both growth rates follow the same trend, and there is no difference in the direction of growth between the two methods. Both growth rates indicate negative growth during 2010-11 and 2022-23. For the agriculture industry, the net capital stock in 2024-25 by the linear method has been estimated at Rs. 18.8 trillion at current prices, and at the 2015-16 base-year constant prices, the net capital stock is about Rs. 6.2 trillion. By the geometric method, the net capital stock in 2024-25 has been estimated at Rs. 18.0 trillion at current prices, and at constant prices of 1015-16, it is about Rs. 6.1 trillion.

Summary results for the industry's capital stock have been presented in Table 6. More frequent negative growth rates are observed in the series from 1999-00 to 2024-25 than in agriculture. Growth trends are roughly the same for linear and geometric methods, except in a few cases where the direction of growth differs. Negative growth has been observed during 2000-01,2001-02, 2009-10 to 2013-14, and 2020-21 to 2022-23 in both the methods. The only exception is 2023-24, where the geometric method shows 0.30% growth, while the linear method estimates -0.96% growth. It is worth mentioning that the net capital stock in 2014-15 for industry, by the linear method at current prices, is Rs. 17.0 trillion, and at the constant prices of 2015-16, it is about Rs. 4.5 trillion. By the geometric method, the net capital stock in 2024-25 for the industry at current prices has been estimated at Rs. 16.25, and at the constant prices of 2015-16, it stands at Rs. 4.8 trillion.

Table 6: Capital Stock Summary Results: Industry

Year	Linear Method					Geometric Method				
	CFC Current	NCS Current	CFC Constant (2015-16 =100)	NCS Constant (2015-16=100)	NCS Constant Growth (%)	CFC Current	NCS Current	CFC Constant (2015-16 =100)	NCS Constant (2015-16=100)	NCS Constant Growth (%)
1999-2000	255,850	1,310,606	811,478	3,927,647		257,918	1,185,500	818,548	3,566,992	
2000-01	262,286	1,347,536	797,562	3,909,066	-0.47	273,274	1,206,531	829,797	3,516,176	-1.42

2001-02	262,337	1,383,559	769,731	3,869,930	-1.00	265,078	1,232,736	774,175	3,472,597	-1.24
2002-03	268,562	1,427,036	781,921	3,965,366	2.47	275,985	1,267,839	807,334	3,542,621	2.02
2003-04	288,729	1,539,546	789,258	3,992,049	0.67	293,410	1,362,368	807,892	3,550,669	0.23
2004-05	303,587	1,644,700	786,579	4,011,086	0.48	295,031	1,464,551	768,313	3,587,972	1.05
2005-06	342,498	1,813,187	827,964	4,201,311	4.74	344,096	1,623,861	829,038	3,777,123	5.27
2006-07	369,333	1,972,434	836,521	4,306,546	2.50	370,964	1,769,120	835,381	3,883,499	2.82
2007-08	415,114	2,256,565	848,263	4,412,727	2.47	415,804	2,033,819	846,600	3,991,343	2.78
2008-09	495,122	2,710,215	852,871	4,564,411	3.44	510,525	2,440,206	879,214	4,116,683	3.14
2009-10	541,200	2,914,267	840,379	4,515,039	-1.08	536,745	2,633,386	835,248	4,072,443	-1.07
2010-11	647,825	3,278,495	844,016	4,296,006	-4.85	628,129	2,972,017	820,093	3,877,332	-4.79
2011-12	726,222	3,547,030	845,883	4,114,076	-4.23	705,755	3,213,610	822,779	3,718,506	-4.10
2012-13	768,109	3,713,959	832,383	4,026,211	-2.14	761,025	3,362,490	824,156	3,638,868	-2.14
2013-14	803,347	3,892,548	806,400	3,924,341	-2.53	787,725	3,528,914	790,229	3,553,170	-2.36
2014-15	811,690	4,001,501	807,071	3,978,325	1.38	825,472	3,614,934	820,606	3,593,618	1.14
2015-16	820,847	4,270,022	820,847	4,270,022	7.33	868,275	3,837,888	868,275	3,837,888	6.80
2016-17	863,903	4,733,280	832,179	4,551,834	6.60	889,460	4,261,660	856,876	4,095,003	6.70
2017-18	940,980	5,334,436	870,819	4,933,477	8.38	952,656	4,835,567	881,470	4,465,994	9.06
2018-19	1,132,037	6,384,386	913,451	5,220,357	5.81	1,128,470	5,820,957	911,670	4,754,655	6.46
2019-20	1,301,030	7,193,862	930,926	5,249,441	0.56	1,284,368	6,563,877	922,095	4,792,570	0.80
2020-21	1,443,173	7,982,220	937,571	5,231,032	-0.35	1,417,310	7,307,895	922,542	4,789,190	-0.07
2021-22	1,732,461	9,650,637	924,363	5,200,258	-0.59	1,704,163	8,870,686	910,531	4,772,248	-0.35
2022-23	2,104,134	12,983,163	821,551	4,965,778	-4.51	2,008,500	12,022,583	785,953	4,592,731	-3.76
2023-24	2,238,654	15,683,231	710,846	4,918,185	-0.96	2,127,888	14,711,770	677,416	4,606,295	0.30
2024-25	1,964,925	17,034,993	588,040	5,004,490	1.75	1,843,828	16,251,766	549,670	4,769,217	3.54

Notes: CFC= Consumption of Fixed Capital, NCS= Net Capital Stock.
Source: Authors' calculations.

Table 7: Capital Stock Summary Results: Services

Year	Linear Method					Geometric Method				
	CFC Current	NCS Current	CFC Constant (2015-16 =100)	NCS Constant (2015-16=100)	NCS Constant Growth (%)	CFC Current	NCS Current	CFC Constant (2015-16 =100)	NCS Constant (2015-16=100)	NCS Constant Growth (%)
1999-2000	209,872	2,739,891	706,140	8,679,344		241,931	2,201,707	805,103	6,973,340	
2000-01	229,052	2,982,501	742,374	9,126,119	5.15	261,869	2,392,682	840,175	7,322,314	5.00
2001-02	243,950	3,174,197	771,658	9,507,364	4.18	279,332	2,536,962	875,634	7,599,583	3.79
2002-03	261,344	3,425,017	795,318	9,921,370	4.35	300,686	2,727,509	907,898	7,901,007	3.97
2003-04	304,527	4,035,613	850,764	10,592,881	6.77	353,502	3,215,930	979,556	8,443,728	6.87
2004-05	360,168	4,696,642	940,898	11,451,489	8.11	420,754	3,750,764	1,090,961	9,152,273	8.39
2005-06	443,775	5,480,024	1,069,931	12,490,133	9.07	519,110	4,388,575	1,245,354	10,015,494	9.43
2006-07	537,887	6,328,839	1,220,230	13,649,788	9.28	624,170	5,085,399	1,409,716	10,985,663	9.69
2007-08	685,127	7,631,693	1,377,463	14,783,533	8.31	775,271	6,156,489	1,553,015	11,943,856	8.72
2008-09	883,095	9,532,182	1,493,562	15,535,765	5.09	967,288	7,694,199	1,629,356	12,560,295	5.16
2009-10	1,031,085	10,494,578	1,580,026	16,071,440	3.45	1,107,079	8,475,398	1,696,366	12,979,630	3.34

2010-11	1,257,798	12,321,855	1,604,819	15,864,959	-1.28	1,343,081	9,838,641	1,715,424	12,662,543	-2.44
2011-12	1,392,497	14,182,996	1,598,135	16,310,342	2.81	1,516,005	11,275,601	1,740,221	12,965,840	2.40
2012-13	1,463,257	15,705,960	1,561,716	16,767,926	2.81	1,625,818	12,410,847	1,735,255	13,249,885	2.19
2013-14	1,555,495	17,589,440	1,537,693	17,416,067	3.87	1,731,354	13,861,200	1,711,736	13,723,983	3.58
2014-15	1,609,219	18,724,559	1,582,517	18,329,032	5.24	1,791,480	14,768,327	1,761,184	14,458,281	5.35
2015-16	1,653,795	19,315,593	1,653,794	19,315,592	5.38	1,828,440	15,270,196	1,828,440	15,270,195	5.62
2016-17	1,833,555	21,357,098	1,758,268	20,506,392	6.16	2,013,597	16,964,675	1,931,120	16,288,143	6.67
2017-18	2,068,934	24,012,279	1,885,083	21,913,476	6.86	2,268,719	19,191,721	2,067,402	17,512,908	7.52
2018-19	2,507,826	28,383,781	1,985,910	22,652,121	3.37	2,733,248	22,651,361	2,166,133	18,071,330	3.19
2019-20	2,843,821	32,041,031	2,043,607	23,244,860	2.62	3,062,312	25,516,367	2,202,507	18,505,169	2.40
2020-21	3,208,459	35,949,804	2,111,158	23,931,959	2.96	3,444,248	28,603,089	2,268,673	19,034,753	2.86
2021-22	4,180,739	47,306,729	2,181,460	24,747,914	3.41	4,483,409	37,645,373	2,339,905	19,692,263	3.45
2022-23	5,115,212	61,068,752	2,014,396	24,153,528	-2.40	5,170,884	48,354,731	2,037,188	19,121,360	-2.90
2023-24	5,548,955	73,082,583	1,832,384	24,370,572	0.90	5,363,327	58,487,884	1,772,873	19,493,750	1.95
2024-25	5,117,130	78,019,309	1,644,913	25,160,109	3.24	4,891,606	63,670,537	1,572,866	20,527,531	5.30

Notes: CFC= Consumption of Fixed Capital, NCS= Net Capital Stock.
Source: Authors' calculations.

Summary results for capital stock in services are shown in Table 7. It can be observed that growth rates of net capital stock at constant prices, calculated by both the linear and geometric methods, follow the same trend. Negative growth has been observed for services in 2010-11 and 2022-23 during 1999-00 to 2024-25. For the services sector, the net capital stock for 2024-25 at current prices by the linear method is Rs. 78.0 trillion, and at the 2015-16 constant prices, the net capital stock for 2024-25 is about Rs. 25.2 trillion. Similarly, by the geometric method, the net capital stock at current prices for 2024-25 is Rs. 63.7 trillion, and at the constant prices of 2015-16, the net capital stock is estimated at Rs. 20.5 trillion.

If we analyse the growth of net capital stock at constant prices for the overall economy, as presented in Table 8, we conclude that, except for 2010-11 and 2022-23, net capital stock has grown. Since negative growth were observed in 2010-11 and 2022-23 for agriculture, industry and services so the same is reflected in the overall economy, however negative growth in industry in the years 2000-01,2001-02, 2009-10, 2011-12 to 2013-14 and 2020-21 to 2021-22 has been offset by agriculture and services at the overall economy level. For the overall economy, the net capital stock for 2024-25 at current prices by the linear method is Rs. 113.8 trillion, and at the 2015-16 constant prices, the net capital stock for 2024-25 is about Rs. 36.4 trillion. Similarly, by the geometric method, the net capital stock at current prices for 2024-25 is Rs. 97.96 trillion, and at the constant prices of 2015-16, the net capital stock is estimated at Rs. 31.4 trillion.

Table 8: Capital Stock Summary Results: Overall Economy

Year	Linear Method					Geometric Method				
	CFC Current	NCS Current	CFC Constant (2015-16 =100)	NCS Constant (2015-16=100)	NCS Constant Growth (%)	CFC Current	NCS Current	CFC Constant (2015-16 =100)	NCS Constant (2015-16=100)	NCS Constant Growth (%)
1999-2000	635,148	5,352,049	2,120,356	16,685,138		675,512	4,572,410	2,242,217	14,407,636	
2000-01	662,637	5,658,677	2,140,874	17,130,348	2.67	712,030	4,802,610	2,285,615	14,708,105	2.09
2001-02	683,683	5,957,266	2,143,129	17,504,937	2.19	725,570	5,029,168	2,257,880	14,967,943	1.77

2002-03	711,296	6,273,414	2,185,528	18,071,553	3.24	762,652	5,275,182	2,334,605	15,385,481	2.79
2003-04	794,176	7,150,479	2,254,410	18,834,958	4.22	854,244	5,993,541	2,419,483	15,983,814	3.89
2004-05	887,001	8,084,359	2,347,371	19,790,588	5.07	950,424	6,777,718	2,511,857	16,774,957	4.95
2005-06	1,020,892	9,117,429	2,521,159	21,129,160	6.76	1,108,734	7,651,787	2,728,589	17,906,098	6.74
2006-07	1,159,879	10,266,075	2,687,782	22,510,617	6.54	1,245,264	8,632,867	2,867,660	19,107,677	6.71
2007-08	1,391,202	12,110,249	2,880,745	23,849,922	5.95	1,476,361	10,212,136	3,039,584	20,288,144	6.18
2008-09	1,724,273	14,810,827	3,027,275	24,868,176	4.27	1,823,808	12,488,964	3,188,650	21,145,023	4.22
2009-10	1,966,122	16,260,099	3,120,839	25,481,582	2.47	2,037,032	13,750,903	3,230,132	21,649,136	2.38
2010-11	2,383,010	18,592,122	3,169,261	24,599,707	-3.46	2,446,480	15,566,142	3,252,192	20,684,330	-4.46
2011-12	2,710,045	21,404,547	3,183,753	24,954,039	1.44	2,807,696	17,889,837	3,295,839	20,926,576	1.17
2012-13	2,890,717	23,473,668	3,154,048	25,424,593	1.89	3,039,340	19,554,840	3,311,395	21,239,784	1.50
2013-14	3,070,465	25,822,650	3,122,903	26,047,581	2.45	3,225,670	21,447,400	3,275,050	21,710,625	2.22
2014-15	3,204,759	27,468,367	3,187,187	27,117,982	4.11	3,396,642	22,848,713	3,375,063	22,593,150	4.06
2015-16	3,289,814	28,485,317	3,289,814	28,485,317	5.04	3,507,127	23,743,172	3,507,127	23,743,171	5.09
2016-17	3,542,331	31,182,043	3,425,280	30,077,215	5.59	3,743,444	26,044,778	3,618,352	25,141,998	5.89
2017-18	3,919,237	34,819,272	3,611,795	31,999,035	6.39	4,128,449	29,226,616	3,802,656	26,872,956	6.88
2018-19	4,640,863	40,799,587	3,775,356	33,145,088	3.58	4,860,431	34,206,263	3,951,756	27,842,609	3.61
2019-20	5,271,357	46,035,229	3,869,822	33,868,101	2.18	5,469,114	38,532,561	4,016,490	28,418,954	2.07
2020-21	5,990,080	52,001,154	3,965,573	34,663,718	2.35	6,198,765	43,582,832	4,106,982	29,073,162	2.30
2021-22	7,489,292	66,527,239	4,045,288	35,597,330	2.69	7,763,988	55,594,939	4,189,579	29,862,483	2.71
2022-23	9,194,795	86,847,743	3,707,474	34,671,021	-2.60	9,075,426	72,331,884	3,659,126	29,050,064	-2.72
2023-24	10,005,142	105,103,939	3,345,632	35,133,934	1.34	9,556,814	88,588,346	3,197,427	29,786,457	2.53
2024-25	9,292,856	113,829,270	2,964,273	36,372,364	3.52	8,761,559	97,962,411	2,793,334	31,409,263	5.45

Notes: CFC= Consumption of Fixed Capital, NCS= Net Capital Stock.
Source: Authors' calculations.

4.4. Incremental Capital Output Ratio (ICOR)

Theoretically ICOR stands for Incremental Capital Output Ratio, which in fact given us an idea that how much new investment capital is needed to produce one additional unit of economic output (like GDP). In other words, it signifies capital efficiency; a lower ICOR means less capital is required for growth (more efficient), while a higher ICOR suggests capital is being used less effectively. During the research, four types of ICORs were calculated: ICOR at current and constant prices, using GFCF as the numerator, and ICOR at current and constant prices, using the change in stocks as the numerator. However, for simplicity, the ICOR at constant prices, using GFCF as the numerator, is presented in Table 9.

The long-term average ICOR for the overall economy stands at **1.40**. This figure masks extreme volatility in capital productivity. The ratio fluctuated from a high of **+15.9 in FY 2009**, indicating significant investment inefficiency, to a sharp decline of **-13.94 in FY 2020** and -50.6 in FY 2023, a period marked by economic contraction in which output fell despite capital inputs. These wide variances underscore the inconsistent utilization of physical assets and the impact of macroeconomic instability on the country's productive efficiency. However, if outliers are excluded, the average ICOR rises to **3.80.** This high ICOR indicates that Pakistan's underlying investment efficiency is weaker and more volatile than the headline long-term average implies.

Table 9: Incremental Capital Output Ratio (ICOP)

Years	ICOR Constant: GFCF / Change in GDP			
	Agriculture	**Industry**	**Services**	**Overall Economy**
1999-2000				

2000-01	-139.96	4.42	2.95	4.50
2001-02	10.03	13.97	3.67	5.86
2002-03	3.68	4.70	2.41	3.17
2003-04	4.18	1.55	2.27	2.22
2004-05	1.89	2.49	2.17	2.17
2005-06	6.71	7.95	2.35	3.38
2006-07	3.64	3.21	3.89	3.66
2007-08	15.17	2.51	4.29	4.16
2008-09	3.79	-5.14	9.40	**15.95**
2009-10	41.59	4.43	6.09	6.84
2010-11	4.84	2.93	4.90	4.32
2011-12	3.92	5.78	4.20	4.35
2012-13	4.05	12.79	2.72	3.58
2013-14	5.07	3.19	3.77	3.86
2014-15	7.07	3.00	3.77	3.96
2015-16	30.65	3.30	3.19	3.90
2016-17	5.89	4.07	3.04	3.57
2017-18	3.42	2.20	3.03	2.84
2018-19	13.68	71.40	2.82	4.66
2019-20	3.25	-2.46	-10.75	**-13.94**
2020-21	3.65	1.75	2.36	2.39
2021-22	3.07	1.84	2.11	2.20
2022-23	5.36	-2.44	270.28	**-50.67**
2023-24	1.94	-8.21	4.52	4.11
2024-25	7.76	1.93	4.10	3.87

Source: Authors' calculations.

CONCLUSION AND POLICY IMPLICATIONS

5.1. Conclusion

The current study has two main objectives: to analyze sector-specific fixed investment flows and to estimate the stock of physical assets across various industries in Pakistan. Industry-wise trends in real gross fixed capital formation and the investment-to-GDP ratio have been analyzed from 2000 to 2025. The results show that the average growth of real gross fixed capital formation in Pakistan during the study period was 2.80%, whereas the average investment-to-GDP ratio was 14.58%. The study indicates that Pakistan's low investment levels impede economic growth and competitiveness, with its investment-to-GDP ratio falling significantly below the regional average and correlating with slower economic growth than neighboring countries. Sector-specific analysis shows resilience in services but stagnation or decline in industry and agriculture, leading to recent contractions in overall real fixed investment, which pose risks to productive capacity and export competitiveness.

The stock of physical capital for detailed economic activities has been measured through linear and geometric methods in nominal and real terms. The results show that from 2000 to 2025, Pakistan's real net capital stock grew by an average of 3.2% annually, reaching a 2024–25 valuation between Rs. 98 trillion and Rs. 114 trillion depending on the estimation method. The services sector drove this expansion, with robust average growth of 4.4%,–4.5%, vastly outpacing agriculture (1.7%,–1.9%) and the industrial sector, which lagged at 1.0%,–1.2% due to frequent contractions. Despite notable growth peaks in the mid-2000s and mid-2010s, the national capital stock suffered overall contractions in 2011 and 2023. The resulting data highlights a significant sectoral imbalance, with the services sector now holding the largest share of physical assets. At the same time, industrial stagnation continues to limit the nation's broader productive foundation.

Low levels of investment, especially compared to regional averages, typically lead to slower economic growth by hindering a country's ability to develop productive capacity, innovate, and compete globally. Pakistan's specific challenge lies in inconsistent capital stock expansion, with the resilient services sector contrasting sharply with the frequently stagnant industrial sector. These fluctuations, characterized by uneven growth across major sectors, underscore a lack of sustained, long-term physical and infrastructural asset deepening. Furthermore, while overall investment efficiency may follow a long-term trend, significant swings in the conversion of capital into output suggest that focusing solely on increasing capital investment without addressing underlying economic conditions and asset utilization issues may not guarantee sustained growth or improved productivity.

5.2. Policy Implications

Pakistan is a capital-deficient country with the lowest investment-to-GDP ratio among the regional economies. The study has identified economic activities for future investment. The study has estimated capital stock statistics in nominal and real terms for Pakistan's economy, which is considered a measure of wealth. These capital stock statistics can be used in future studies to compile productivity statistics, paving the way for efficiency analysis across various industries. The capital stock statistics have also been used to derive measures of consumption of fixed capital for various industries in nominal and real terms, enabling the compilation of net aggregates for the economy. The improved estimates of consumption of fixed capital will also result in higher value added for public sector industries, including general government, education, and health and social work, which

is compiled as the sum of compensation of employees and consumption of fixed capital. Finally, the availability of estimates of consumption of fixed capital will enable the compilation of GDP using the income approach, a missing link in Pakistan's National Statistical System. The study results will help inform evidence-based policy formulation, implementation, and evaluation to improve investment in Pakistan.

REFERENCES

Abid, T., Mudassar, K., Ejaz, R., & Khan, A. (2016). Agriculture and industrial sector growth in Pakistan: The role of human and physical capital. *J. Agric. & Environ. Sci*, *16*(6), 1079–1090.

Ahmad, K., Chaudhary, M. A., & Ilyas, M. (2008). Trends in total factor productivity in the Pakistan agriculture sector. *Pakistan Economic and Social Review, 46*(2), 117–132.

Ali, G. (2015). Gross fixed capital formation and economic growth of Pakistan. *Journal of Research in Humanities, Arts and Literature Applied*, *1*(2), 21–30.

Ali, L., & Akhtar, N. (2024). The effectiveness of export, FDI, human capital, and R&D on total factor productivity growth: The case of Pakistan. *Journal of the Knowledge Economy*, *15*(1), 3085–3099.

Ali, L., & Ramay, M. I. (2014). Effects of human capital and trade orientation on output and total factor productivity in Pakistan. *Research Journal of Applied Sciences, Engineering and Technology*, *8*(13), 1594–1606.

Ali, S., Waqas, H., Asghar, M., Kalroo, R., Ayaz, M., & Khan, M. (2014). Foreign capital and investment in Pakistan: A cointegration and causality analysis. *Journal of Basic and Applied Scientific Research*, *4*(4), 217–226.

Batool, I., & Goldmann, K. (2021). The role of public and private transport infrastructure capital in economic growth. Evidence from Pakistan. *Research in Transportation Economics*, *88*, 100886.

Berlemann, M., & Wesselhöft, J. E. (2012). *Estimating aggregate capital stocks using the perpetual inventory method: New empirical evidence for 103 countries* [Discussion paper]. Diskussionspapier Nr. 125, Helmut-Schmidt-Universität – Universität der Bundeswehr Hamburg, Fächergruppe Volkswirtschaftslehre, Hamburg.

Chen, X., & Plotnikova, T. (2014). Measuring the initial capital stock: A generalized framework. *Procedia Economics and Finance*, *14*, 147-153.

Chishti, M. Z. (2022). Analysis of the nexus between demographic changes and economic growth in Pakistan: role of capital stock. *Iranian Economic Review*, *26*(3), 489–510.

De la Fuente, A., & Doménech, R. (2006). Human capital in growth regressions: How much difference does data quality make?. *Journal of the European Economic Association*, *4*(1), 1–36.

GOB (Government of Bangladesh). (2022). *Bangladesh national accounts statistics: Sources and methods, statistics and informatics division (SID)*. Bangladesh Bureau of Statistics, Ministry of Planning, Government of the People's Republic of Bangladesh.

GOI (Government of India). (2012). *National accounts statistics – Sources & methods-2012*. Central Statistics Office, Ministry of Statistics and Programme Implementation, Government of India.

GOSL (Government of Sri Lanka). (2022). *Sources and methods for the national accounting system - Sri Lanka (base year 2015).* Department of Census & Statistics. Ministry of Finance, Economics Stabilization and National Policies, Government of Sri Lanka.

Griliches, Z. (1980). *R&D and the productivity slowdown* [Working Paper]. National Bureau of Economic Research No. w0434.

Harberger, A. C. (1978). Perspectives on capital and technology in less-developed countries. In M. J. Artis & A. R. Nobay (Eds.), *Contemporary economic analysis*. Croom-Helm, London.

IMF (International Monetary Fund). (2017). Estimating the stock of public capital in 170 countries:

January 2017 update. https://www.imf.org/external/np/fad/publicinvestment/pdf/csupdate_jan17.pdf

Ishfaq, M., Rasool, A., Asghar, M. M., Karim, S., & Ahmad, R. (2024). Impact of natural, physical, and human capital formation on economic growth in Pakistan: An ARDL analysis. *Journal of Asian Development Studies*, *13*(3), 222–233.

Islam, M., Zhang, B., & Managi, S. (2022). The trade-off between natural capital and human capital in Pakistan. *Sustainability Science*, *17*(5), 1799-1811.

Jacob, V., Sharma, S. C., & Grabowski, R. (1997). Capital stock estimates for major sectors and disaggregated manufacturing in selected OECD countries. *Applied Economics*, *29*(5), 563–579.

Judson, R. (2002). Measuring human capital like physical capital: What does it tell us?. *Bulletin of Economic Research*, *54*(3), 209–231.

Kamps, C. (2006). New estimates of government net capital stocks for 22 OECD countries, 1960–2001. *IMF Staff Papers*, *53*(1), 120–150.

Khan, S. U. (2006). Macro determinants of total factor productivity in Pakistan. *State Bank of Pakistan Research Bulletin, 2*(2), 383–401

Mazher, M. A., & Dahalan, J. (2021). Pakistan's infrastructure capital-growth analysis. *SEISENSE Journal of Management*, *4*(1), 1–12.

Mujahid, N., Amin, A., & Khattak, S. W. (2014). Human capital investment and the physical capital nexus (a path to the country's economic growth): A case study of Pakistan, 1980-2010. *PUTAJ-Humanities and Social Sciences*, *21*(2), 181–187.

Naqvi, N. H. (2003). *Is Public capital more productive than private capital? Macroeconomic evidence from Pakistan, 1965-2000* [Working Paper]. Working Paper in Economics and Finance No. 03/03, University of Durham (November 2003).

Nehro, V. and A. Dharashwar, (1993). A new database on physical capital stock: Sources, methodology, and results. *Rev. Anal. Econ., 8*(1): 37–59.

OECD (Organisation for Economic Co-Operation and Development) Manual (2009). Measuring capital: OECD manual 2009. Second Edition.

GOP (Government of Pakistan). (2025). National Accounts Statistics. Pakistan Bureau of Statistics, Government of Pakistan, Islamabad. https://www.pbs.gov.pk/national-accounts-2

Pomi, S. S., Sarkar, S. M., & Dhar, B. K. (2021). Human or physical capital, which influences sustainable economic growth most? A study on Bangladesh. *Canadian Journal of Business and Information Studies*, *3*(5), 101–108.

Umair, M., Ahmad, W., Hussain, B., Antohi, V. M., Fortea, C., & Zlati, M. L. (2024). The role of labor force, physical capital, and energy consumption in shaping agricultural and industrial output in Pakistan. *Sustainability*, *16*(17), 7425.

UN (United Nations). (2009). *System of national accounts 2008*. European Commission. International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations, and World Bank, New York.

World Bank. (2025). World Bank open data: Gross capital formation (% of GDP). https://data.worldbank.org/indicator/NE.GDI.TOTL.ZS

APPENDICES

Appendix-I: Real Growth Rates of Fixed Investment (%)

Industries	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Agriculture	-0.17	2.63	4.93	2.12	2.69	5.03	2.00	0.91	5.41	4.07	1.29	-0.91	3.63
i) Crops	-7.29	-2.93	10.97	-0.96	-0.42	9.12	-1.12	-4.89	14.25	8.47	-2.80	-12.33	6.35
ii) Livestock	2.61	4.72	2.96	3.48	3.91	4.01	3.10	2.83	3.05	2.81	2.99	2.85	3.05
iii) Forestry	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17
iv) Fishing	0.31	1.33	4.48	-1.30	0.49	0.45	1.44	0.71	0.27	0.51	-2.72	0.48	0.18
Industry	5.35	-6.21	20.09	-7.00	-1.27	26.58	-7.65	1.35	5.25	-21.26	-15.11	-1.12	12.13
Mining and quarrying	9.53	9.54	199.33	-37.32	-65.63	43.62	18.77	-17.48	20.74	16.82	-35.35	10.06	-27.84
Manufacturing	8.78	6.48	-6.50	17.40	11.99	24.20	-11.60	1.80	-3.74	-30.76	-18.44	0.66	19.93
i. Large Scale	8.77	6.31	-7.56	18.08	12.21	25.29	-12.78	1.38	-4.63	-34.26	-22.29	-0.69	22.78
ii. Small Scale (including Slaughtering)	8.99	9.01	9.04	9.06	9.08	9.10	7.16	7.17	7.18	7.19	7.19	7.20	7.21
Electricity, gas, and water supply	-0.78	-48.66	26.23	-36.34	19.24	30.63	-14.35	21.26	38.73	-5.22	14.65	-12.26	15.78
Construction	-9.45	18.37	-63.41	26.89	102.17	28.47	22.71	-6.76	14.77	-26.81	-37.65	19.41	6.16
Services	7.41	-3.05	4.89	25.88	18.21	21.32	9.01	5.52	-10.57	-5.79	-10.07	7.40	-1.19
Wholesale and retail trade	5.95	2.43	6.65	10.71	13.98	9.51	5.85	5.66	-3.02	1.77	2.05	1.68	3.55
Accommodation and food service activities (Hotels and Restaurants)	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08
Transportation and storage	18.64	-13.32	-1.29	44.67	17.17	18.28	-14.45	-5.23	-28.35	14.75	-14.35	-1.36	27.59
Information and communication	31.14	-30.85	-31.99	166.15	90.29	69.07	19.39	7.78	-42.88	-16.95	-49.20	-13.22	6.42
Financial and insurance activities	-18.53	40.34	5.70	16.97	4.80	16.79	25.64	7.63	-13.05	-24.71	-23.19	14.03	22.89
Real estate activities (Ownership of Dwellings)	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Public Administration and Social Security (General Government)	-1.69	-2.76	21.58	34.46	18.54	23.20	32.67	1.84	11.53	-16.75	-10.32	19.29	-18.36
Education	4.09	3.93	15.36	18.33	6.33	9.25	6.44	12.75	-0.39	-3.80	-3.86	18.75	-19.37
Human health and social work activities	1.92	1.76	13.53	18.53	12.00	14.97	-13.02	70.06	-4.70	-15.25	-3.70	11.30	-8.55
Other Private Services	5.62	6.50	5.15	4.69	4.83	9.59	4.73	4.99	3.94	5.91	4.72	6.20	5.24
Total Economy	4.89	-2.64	9.31	9.65	9.45	19.16	3.39	3.71	-4.14	-7.69	-8.62	3.68	2.45

Appendix-I Cont.

Industries	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Agriculture	-0.61	5.32	0.35	5.52	3.65	0.76	0.00	4.75	4.23	-3.20	5.61	0.55
i) Crops	-9.06	13.00	-8.12	16.69	6.60	-6.23	-11.26	13.16	9.02	-22.20	13.04	-7.68
ii) Livestock	1.80	3.56	2.79	2.91	2.97	2.87	3.07	2.96	3.15	1.87	4.22	2.40
iii) Forestry	2.17	2.17	2.14	2.23	2.11	2.20	2.15	2.18	2.19	2.15	2.16	2.18
iv) Fishing	1.01	0.53	0.41	0.36	0.29	0.83	0.66	0.44	0.58	0.43	1.77	1.13
Industry	-5.37	22.22	29.21	0.13	12.43	-4.16	-20.02	-4.25	-2.78	-21.26	-2.96	-1.81
Mining and quarrying	38.10	6.76	38.79	-17.10	-29.56	-19.11	-4.40	-32.77	2.41	19.78	3.43	-2.60
Manufacturing	-3.84	12.02	49.82	-0.40	2.56	-4.50	-11.15	-0.23	-4.20	-25.05	-8.48	-8.18
i. Large Scale	-6.00	13.09	58.81	-1.80	1.46	-6.89	-15.31	0.90	-5.33	-24.20	-6.82	-10.88
ii. Small Scale (including Slaughtering)	7.21	7.23	7.23	9.45	9.46	9.47	9.48	-4.56	0.38	-28.32	-15.23	3.82
Electricity, gas, and water supply	-34.42	86.12	-15.76	-8.76	97.62	9.96	-40.21	-7.64	-7.02	-13.43	10.81	3.45
Construction	54.82	-18.77	28.51	66.06	-27.54	-53.10	4.68	-7.98	43.43	-38.85	-11.28	57.23
Services	8.25	14.17	5.81	11.69	11.63	-17.24	-3.24	6.14	7.12	-19.17	-4.77	18.56
Wholesale and retail trade	4.77	2.65	4.78	9.12	24.01	22.93	-13.86	2.44	-17.82	-35.53	6.42	37.55
Accommodation and food service activities (Hotels and Restaurants)	4.08	4.08	4.08	18.80	-12.56	-13.60	-38.68	-10.09	-17.73	-38.07	6.37	216.85
Transportation and storage	-13.27	37.17	13.42	13.08	17.82	-21.18	-40.71	51.30	9.94	-44.20	-13.38	-1.04
Information and communication	103.48	1.56	-36.84	-4.76	-13.49	-6.58	115.63	-42.74	42.96	-66.09	-11.14	12.12
Financial and insurance activities	-21.08	22.17	18.40	11.28	-10.87	2.03	-2.85	11.87	-0.11	-11.10	3.56	17.13
Real estate activities (Ownership of Dwellings)	4.00	4.00	4.00	3.73	3.72	3.63	3.55	3.65	3.68	3.67	3.71	3.70
Public Administration and Social Security (General Government)	11.29	21.81	21.35	23.51	20.68	-43.60	0.25	10.09	22.20	-18.10	-15.81	36.31
Education	14.05	12.81	10.12	-2.64	-0.57	-7.43	-0.11	14.22	-10.71	-2.44	-5.12	26.28
Human health and social work activities	-19.67	41.95	-12.62	12.61	12.32	-20.30	12.00	12.68	1.96	-5.60	0.65	14.66
Other Private Services	7.66	6.02	6.64	10.80	10.10	3.87	-4.12	4.16	-2.06	1.82	1.75	4.53
Total Economy	**3.35**	**13.66**	**9.38**	**7.73**	**10.29**	**-11.06**	**-6.68**	**3.67**	**4.57**	**-16.06**	**-1.85**	**10.29**

Appendix-II: Real Growth Rates of GDP (%)

Industries	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Agriculture	**-0.09**	**1.26**	**3.56**	**3.09**	**6.79**	**1.89**	**3.48**	**0.81**	**3.41**	**0.31**	**2.71**	**3.23**	**3.14**
i) Crops	-6.70	-3.16	1.40	0.83	12.92	-0.31	5.67	-2.32	3.95	-5.24	2.08	1.25	2.79
ii) Livestock	5.62	5.17	4.44	4.74	4.66	4.58	2.81	3.91	3.32	4.04	3.98	4.52	3.31
iii) Forestry	7.78	4.79	12.54	4.01	-15.21	-17.85	-10.31	-17.04	-2.91	6.32	-2.32	2.68	6.41
iv) Fishing	-2.96	-12.34	3.45	1.97	0.57	20.86	0.10	8.18	2.72	1.39	-16.91	3.72	0.65
Industry	**6.66**	**1.85**	**6.49**	**17.19**	**9.02**	**3.28**	**7.27**	**8.78**	**-4.15**	**3.95**	**4.87**	**2.33**	**1.16**
Mining and quarrying	6.09	6.68	9.89	20.89	-10.41	4.91	5.45	3.70	-1.04	2.42	-4.04	5.26	1.77
Manufacturing	10.67	4.27	7.41	16.34	15.73	10.44	8.06	6.14	-3.94	1.73	2.61	2.01	5.37
i. Large Scale	11.78	3.74	7.63	18.86	17.93	10.84	8.60	6.02	-6.06	0.52	1.56	0.85	4.81
ii. Small Scale (including Slaughtering)	6.36	6.47	6.51	6.22	5.82	8.44	5.31	6.75	7.17	7.25	7.14	6.76	7.53
Electricity, gas, and water supply	-3.99	-8.63	1.86	32.55	-3.57	-37.19	-4.31	31.44	-5.69	16.40	49.35	1.42	-21.15
Construction	5.79	-0.49	3.89	0.33	20.87	12.33	12.49	13.37	-6.70	7.27	-7.97	2.17	5.40
Services	**4.95**	**3.68**	**5.66**	**7.17**	**8.28**	**8.53**	**5.19**	**4.72**	**1.84**	**2.63**	**2.86**	**3.48**	**5.13**
Wholesale and retail trade	4.87	1.77	5.59	10.07	13.07	8.41	5.12	4.48	-2.90	1.15	1.52	1.00	3.31
Accommodation and food service activities (Hotels and Restaurants)	6.09	1.65	5.29	4.46	5.04	5.06	7.95	1.98	6.92	2.83	2.63	1.50	5.21
Transportation and storage	10.02	10.03	10.01	9.97	9.95	10.13	4.79	4.96	4.99	4.99	5.00	4.85	5.00
Information and communication	1.49	2.51	7.07	24.18	26.86	35.35	24.42	30.85	16.35	-1.50	-1.67	16.46	4.96
Financial and insurance activities	10.84	5.13	6.25	12.09	20.32	15.08	7.88	10.49	-5.43	-6.84	-5.88	-0.64	6.98
Real estate activities (Ownership of Dwellings)	3.75	3.50	3.19	3.44	3.37	3.65	3.81	3.90	4.01	4.00	4.11	3.59	4.41
Public Administration and Social Security (General Government)	1.64	6.50	6.20	5.81	5.22	9.54	-1.82	0.45	-10.35	8.32	7.51	12.30	9.97
Education	2.80	8.40	10.22	9.52	3.10	18.42	1.14	7.49	9.33	-0.58	4.36	-0.93	6.15
Human health and social work activities	4.44	5.63	7.52	4.98	4.99	10.87	11.12	8.00	29.54	7.31	1.68	9.97	8.35
Other Private Services	6.07	7.83	5.48	4.35	3.66	8.34	4.24	5.12	6.19	6.37	5.91	5.90	5.64
Total Economy	**3.64**	**2.62**	**5.17**	**7.69**	**8.00**	**5.66**	**5.11**	**4.44**	**1.06**	**2.26**	**3.20**	**3.20**	**3.86**

Appendix-II Cont.

Industries	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Agriculture	**2.42**	**1.78**	**0.41**	**2.22**	**3.88**	**0.94**	**3.91**	**3.52**	**4.21**	**2.24**	**6.40**	**1.51**
i) Crops	1.83	-0.99	-3.86	1.37	4.61	-4.38	6.32	5.83	8.22	-1.17	10.86	-1.06
ii) Livestock	2.86	3.98	2.38	2.89	3.59	3.65	2.80	2.38	2.25	3.70	4.38	2.95
iii) Forestry	1.40	-13.49	14.86	-2.92	2.24	7.22	3.36	3.35	0.70	17.40	-1.10	2.88
iv) Fishing	0.92	5.47	3.23	1.22	1.57	0.78	0.63	0.73	0.35	0.60	0.79	1.40
Industry	**4.34**	**5.40**	**6.01**	**4.61**	**9.18**	**0.25**	**-5.75**	**8.20**	**7.01**	**-3.88**	**-0.89**	**5.26**
Mining and quarrying	1.02	3.95	5.64	-0.89	7.26	0.54	-7.17	1.72	-6.66	-3.23	-2.43	-3.67
Manufacturing	5.76	4.12	4.03	4.87	7.08	4.52	-7.80	10.52	10.86	-5.26	3.03	1.96
i. Large Scale	5.42	3.32	3.12	4.09	6.92	3.53	-11.23	11.50	11.90	-9.84	0.94	-0.69
ii. Small Scale (including Slaughtering)	7.05	7.06	7.27	7.54	7.61	7.80	3.09	7.86	7.89	8.15	8.14	7.90
Electricity, gas, and water supply	1.34	10.83	7.10	1.41	7.95	5.55	3.53	9.01	4.36	9.65	-17.32	29.05
Construction	3.19	8.33	14.37	10.20	19.55	-18.14	-3.08	2.39	1.83	-10.25	-1.38	6.58
Services	**3.82**	**4.20**	**5.03**	**5.62**	**5.95**	**5.00**	**-1.21**	**5.91**	**6.69**	**0.04**	**2.25**	**3.09**
Wholesale and retail trade	4.43	2.34	4.02	6.45	6.76	3.55	-5.26	10.81	10.21	-3.98	3.31	0.46
Accommodation and food service activities (Hotels and Restaurants)	4.36	5.05	2.82	4.08	3.31	7.63	-8.94	4.87	4.45	3.80	1.65	2.66
Transportation and storage	4.92	4.90	4.95	4.02	4.10	4.12	4.08	4.10	4.08	4.09	4.10	4.08
Information and communication	-1.83	7.91	7.04	10.51	4.19	8.50	13.77	9.84	17.96	-0.61	4.30	7.01
Financial and insurance activities	3.66	5.44	5.06	8.23	8.76	6.10	-2.22	5.49	6.92	-9.76	-12.74	6.44
Real estate activities (Ownership of Dwellings)	3.93	4.01	4.71	3.65	3.62	3.70	3.83	3.65	3.69	3.72	3.74	3.75
Public Administration and Social Security (General Government)	-8.62	7.83	7.25	6.14	10.93	3.47	3.00	-0.55	1.81	-7.02	-7.00	9.19
Education	15.89	-1.68	11.00	-1.57	3.54	1.96	3.31	-1.20	5.85	5.73	10.06	3.56
Human health and social work activities	5.89	7.10	6.48	12.08	5.69	7.73	6.18	2.90	2.68	9.36	3.34	3.52
Other Private Services	6.58	5.98	6.58	7.37	7.63	6.17	5.00	5.06	4.73	4.22	3.63	3.53
Total Economy	**3.56**	**3.81**	**4.07**	**4.61**	**6.10**	**3.12**	**-0.94**	**5.77**	**6.18**	**-0.21**	**2.58**	**3.09**

Appendix-III: Real Investment-to-GDP Ratios (%)

Industries	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Agriculture	**12.3**	**12.3**	**12.5**	**12.7**	**12.5**	**12.1**	**12.4**	**12.2**	**12.3**	**12.5**	**13.0**	**12.8**	**12.3**	**12.3**
Crops	7.2	7.2	7.2	7.9	7.7	6.8	7.5	7.0	6.8	7.5	8.6	8.2	7.1	7.3
Livestock	17.4	16.9	16.8	16.6	16.4	16.3	16.2	16.2	16.0	16.0	15.8	15.7	15.4	15.4
Forestry	0.5	0.4	0.4	0.4	0.4	0.5	0.6	0.7	0.8	0.8	0.8	0.9	0.8	0.8
Fishing	33.3	34.4	39.7	40.1	38.8	38.8	32.2	32.7	30.4	29.7	29.4	34.5	33.4	33.2
Industry	**28.0**	**27.6**	**25.4**	**28.7**	**22.8**	**20.6**	**25.3**	**21.8**	**20.3**	**22.3**	**16.9**	**13.6**	**13.2**	**14.6**
Mining and quarrying	19.6	20.2	20.7	56.5	29.3	11.2	15.4	17.3	13.8	16.8	19.2	12.9	13.5	9.6
Manufacturing	30.6	30.0	30.7	26.7	26.9	26.1	29.3	24.0	23.0	23.0	15.7	12.5	12.3	14.0
i. Large Scale	36.0	35.0	35.9	30.8	30.6	29.2	33.0	26.5	25.3	25.7	16.8	12.9	12.7	14.8
ii. Small Scale (including Slaughtering)	9.3	9.5	9.8	10.0	10.3	10.6	10.7	10.8	10.9	10.9	10.9	10.9	10.9	10.9
Electricity, gas, and water supply	40.4	41.8	23.5	29.1	14.0	17.3	35.9	32.2	29.7	43.6	35.5	27.3	23.6	34.6
Construction	11.0	9.4	11.2	3.9	5.0	8.3	9.5	10.4	8.5	10.5	7.2	4.9	5.7	5.7
Services	**13.6**	**13.9**	**13.0**	**12.9**	**15.2**	**16.6**	**18.5**	**19.2**	**19.3**	**17.0**	**15.6**	**13.6**	**14.1**	**13.3**
Wholesale and retail trade	3.4	3.4	3.5	3.5	3.5	3.5	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7
Accommodation and food service activities (Hotels and Restaurants)	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.2
Transportation and storage	142.4	153.5	120.9	108.5	142.8	152.2	163.4	133.4	120.5	82.2	89.9	73.3	69.0	83.8
Information and communication	79.2	102.3	69.0	43.8	93.9	140.9	176.0	168.9	139.1	68.3	57.6	29.7	22.2	22.5
Financial and insurance activities	13.1	9.7	12.9	12.8	13.4	11.6	11.8	13.8	13.4	12.3	10.0	8.1	9.3	10.7
Real estate activities (Ownership of Dwellings)	29.4	29.5	29.6	29.9	30.0	30.2	30.3	30.4	30.4	30.4	30.4	30.4	30.5	30.4
Public Administration and Social Security (General Government)	23.6	22.8	20.8	23.8	30.3	34.1	38.3	51.8	52.5	65.4	50.2	41.9	44.5	33.0
Education	19.7	20.0	19.2	20.1	21.7	22.3	20.6	21.7	22.8	20.7	20.1	18.5	22.2	16.8
Human health and social work activities	37.2	36.3	35.0	36.9	41.7	44.5	46.1	36.1	56.9	41.8	33.0	31.3	31.7	26.7
Other Private Services	8.2	8.2	8.1	8.0	8.1	8.1	8.2	8.3	8.3	8.1	8.1	8.0	8.0	8.0
Total Economy	**15.6**	**15.8**	**15.0**	**15.6**	**15.8**	**16.1**	**18.1**	**17.8**	**17.7**	**16.8**	**15.1**	**13.4**	**13.5**	**13.3**

Appendix-III Cont.

Industries	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Agriculture	**12.0**	**12.4**	**12.4**	**12.8**	**12.7**	**12.7**	**12.2**	**12.4**	**12.4**	**11.7**	**11.6**	**11.6**
Crops	6.5	7.4	7.1	8.2	8.4	8.2	6.8	7.3	7.4	5.8	5.9	5.9
Livestock	15.2	15.1	15.2	15.2	15.1	15.0	15.0	15.1	15.3	15.0	15.0	14.6
Forestry	0.8	1.0	0.9	0.9	0.9	0.9	0.9	0.8	0.9	0.7	0.8	0.8
Fishing	33.3	31.7	30.8	30.6	30.2	30.2	30.2	30.1	30.2	30.1	30.4	30.4
Industry	**13.3**	**15.4**	**18.7**	**17.9**	**18.5**	**17.7**	**15.0**	**13.3**	**12.0**	**9.9**	**9.7**	**9.1**
Mining and quarrying	13.1	13.5	17.7	14.8	9.7	7.8	8.0	5.3	5.8	7.2	7.8	7.8
Manufacturing	12.7	13.7	19.7	18.7	17.9	16.4	15.8	14.3	12.3	9.8	8.7	7.8
i. Large Scale	13.2	14.5	22.3	21.0	20.0	17.9	17.1	15.5	13.1	11.0	10.2	9.2
ii. Small Scale (including Slaughtering)	10.9	10.9	10.9	11.1	11.3	11.5	12.2	10.8	10.0	6.7	5.2	5.0
Electricity, gas, and water supply	22.4	37.6	29.6	26.6	48.8	50.8	29.3	24.9	22.2	17.5	24.2	19.4
Construction	8.6	6.4	7.2	10.9	6.6	3.8	4.1	3.7	5.2	3.5	3.2	4.7
Services	**13.9**	**15.2**	**15.3**	**16.2**	**17.0**	**13.4**	**13.2**	**13.2**	**13.2**	**10.7**	**10.0**	**11.5**
Wholesale and retail trade	3.7	3.7	3.8	3.9	4.5	5.3	4.8	4.5	3.3	2.2	2.3	3.2
Accommodation and food service activities (Hotels and Restaurants)	2.2	2.1	2.2	2.5	2.1	1.7	1.1	1.0	0.8	0.5	0.5	1.5
Transportation and storage	69.3	90.6	97.9	106.4	120.4	91.2	51.9	75.5	79.7	42.7	35.6	33.8
Information and communication	46.6	43.8	25.9	22.3	18.5	15.9	30.2	15.7	19.1	6.5	5.5	5.8
Financial and insurance activities	8.2	9.5	10.7	11.0	9.0	8.6	8.6	9.1	8.5	8.4	9.9	11.3
Real estate activities (Ownership of Dwellings)	30.4	30.4	30.2	30.2	30.2	30.2	30.1	30.1	30.1	30.1	30.1	30.1
Public Administration and Social Security (General Government)	40.2	45.5	51.4	59.8	65.1	35.5	34.5	38.2	45.9	40.4	36.6	45.4
Education	16.6	19.0	18.9	18.7	17.9	16.3	15.7	18.2	15.3	14.1	12.3	14.8
Human health and social work activities	20.3	26.9	22.0	22.2	23.5	17.4	18.4	20.1	20.0	17.2	16.8	18.6
Other Private Services	8.0	8.0	8.0	8.3	8.5	8.3	7.6	7.5	7.0	6.9	6.8	6.8
Total Economy	**13.3**	**14.5**	**15.3**	**15.7**	**16.3**	**14.1**	**13.3**	**13.0**	**12.8**	**10.8**	**10.3**	**11.1**

Appendix IV: Incremental Capital Output Ratio (ICOR): Constant GFCF

Industries/Sectors	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Agriculture, forestry and fishing		**-139.96**	**10.03**	**3.68**	**4.18**	**1.89**	**6.71**	**3.64**	**15.17**	**3.79**	**41.59**	**4.84**	**3.92**	**4.05**
Crops		-1.02	-2.31	5.21	9.07	0.68	146.11	1.29	-3.42	1.99	-1.46	3.29	14.70	2.50
Cotton Ginning		-0.22	-0.51	-0.27	-1.43	0.02	-0.10	-1.19	-0.09	0.74	0.12	-0.09	0.05	-0.19
Livestock		3.17	3.39	3.88	3.62	3.64	3.69	5.92	4.26	4.98	4.06	4.08	3.56	4.80
Forestry		0.06	0.09	0.03	0.10	-0.03	-0.03	-0.06	-0.04	-0.28	0.14	-0.36	0.32	0.13
Fishing		-11.27	-2.82	12.04	20.06	68.74	1.87	335.83	4.02	11.20	21.47	-1.69	9.30	51.71
Industrial Activities		**4.42**	**13.97**	**4.70**	**1.55**	**2.49**	**7.95**	**3.21**	**2.51**	**-5.14**	**4.43**	**2.93**	**5.78**	**12.79**
Mining and quarrying		3.52	3.31	6.28	1.69	-0.97	3.28	3.35	3.86	-16.08	8.11	-3.07	2.70	5.50
Manufacturing		3.11	7.48	3.87	1.92	1.92	3.10	3.21	3.98	-5.62	9.25	4.90	6.23	2.75
i. Large Scale		*3.32*	*9.97*	*4.35*	*1.93*	*1.92*	*3.37*	*3.34*	*4.46*	*-3.99*	*32.19*	*8.36*	*15.01*	*3.23*
ii. Small Scale (including Slaughtering)		1.60	1.61	1.64	1.75	1.92	1.37	2.15	1.72	1.63	1.61	1.63	1.72	1.56
Electricity, gas, and water supply		-10.04	-2.48	15.95	0.57	-4.67	-0.61	-7.14	1.24	-7.23	2.52	0.83	16.85	-1.29
Construction		1.71	-22.73	1.05	15.00	0.48	0.87	0.93	0.72	-1.46	1.06	-0.56	2.67	1.12
Services		**2.95**	**3.67**	**2.41**	**2.27**	**2.17**	**2.35**	**3.89**	**4.29**	**9.40**	**6.09**	**4.90**	**4.20**	**2.72**
Wholesale and retail trade		0.74	1.99	0.66	0.38	0.31	0.46	0.74	0.85	-1.22	3.22	2.47	3.77	1.16
Accommodation and food service activities		2.77	2.62	2.48	2.36	2.23	2.08	4.15	3.98	3.92	3.89	3.85	3.93	3.79
Transportation and storage		2.33	7.02	2.13	3.48	3.45	3.87	2.00	7.07	1.42	3.73	3.34	5.64	2.04
Information and communication		69.70	28.15	6.64	4.82	6.66	6.74	8.61	5.90	4.86	-37.90	-17.51	1.57	4.76
Financial and insurance activities		0.99	2.64	2.18	1.24	0.69	0.90	1.89	1.41	-2.15	-1.36	-1.30	-14.47	1.64
Real estate activities (Ownership of Dwellings)		8.17	8.77	9.67	9.02	9.26	8.62	8.28	8.09	7.88	7.90	7.69	8.79	7.20
Public Administration and Social Security		14.14	3.41	4.08	5.52	6.87	4.40	-27.90	116.44	-5.66	6.54	6.00	4.06	3.64
Education		7.33	2.47	2.16	2.49	7.44	1.33	19.29	3.27	2.43	-34.44	4.43	-23.66	2.91
Human health and social work activities		8.55	6.57	5.28	8.79	9.36	4.70	3.61	7.67	1.83	4.85	18.91	3.49	3.47
Other Private Services		1.43	1.11	1.55	1.93	2.31	1.07	2.04	1.70	1.39	1.35	1.43	1.43	1.49
Total Economy		**4.50**	**5.86**	**3.17**	**2.22**	**2.17**	**3.38**	**3.66**	**4.16**	**15.95**	**6.84**	**4.32**	**4.35**	**3.58**

Appendix IV Cont.

Industries/Sectors	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Agriculture, forestry and fishing	**5.07**	**7.07**	**30.65**	**5.89**	**3.42**	**13.68**	**3.25**	**3.65**	**3.07**	**5.36**	**1.94**	**7.76**
Crops	3.48	-5.37	-2.66	7.41	2.08	-2.06	1.11	1.20	1.00	-17.06	0.68	-17.05
Cotton Ginning	-0.53	0.10	-0.03	0.17	0.10	-0.07	-0.22	-0.07	0.12	-0.05	0.03	-0.05
Livestock	5.46	3.96	6.55	5.42	4.36	4.26	5.53	6.52	6.93	4.20	3.57	5.21
Forestry	0.59	-0.06	0.07	-0.30	0.41	0.13	0.26	0.26	1.23	0.05	-0.85	0.29
Fishing	36.30	6.11	9.84	25.46	19.54	39.22	48.47	41.48	86.36	50.79	38.99	21.96
Industrial Activities	**3.19**	**3.00**	**3.30**	**4.07**	**2.20**	**71.40**	**-2.46**	**1.75**	**1.84**	**-2.44**	**-8.21**	**1.93**
Mining and quarrying	12.97	3.54	3.31	-16.46	1.44	14.52	-1.04	3.14	-0.82	-2.16	-2.24	-3.47
Manufacturing	2.34	3.47	5.10	4.04	2.72	3.79	-1.87	1.50	1.26	-1.76	2.95	4.17
i. Large Scale	*2.57*	*4.50*	*7.37*	*5.35*	*3.08*	*5.26*	*-1.35*	*1.50*	*1.23*	*-1.01*	*10.92*	*-13.10*
ii. Small Scale (including Slaughtering)	1.66	1.66	1.61	1.59	1.60	1.59	4.06	1.48	1.37	0.88	0.69	0.77
Electricity, gas, and water supply	16.90	3.85	4.46	19.19	6.62	9.67	8.60	3.01	5.30	1.99	-1.07	0.96
Construction	2.77	0.84	0.57	1.18	0.40	-0.17	-1.29	1.57	2.88	-0.31	-3.00	0.92
Services	**3.77**	**3.77**	**3.19**	**3.04**	**3.03**	**2.82**	**-10.75**	**2.36**	**2.11**	**270.28**	**4.52**	**4.10**
Wholesale and retail trade	0.88	1.64	0.97	0.64	0.71	1.55	-0.87	0.46	0.36	-0.54	0.72	6.94
Accommodation and food service activities (Hotels and Restaurants)	3.81	3.80	3.73	5.20	4.29	3.54	2.11	1.81	1.44	0.85	0.87	2.86
Transportation and storage	2.01	2.28	4.41	3.35	4.68	1.55	-0.73	2.22	2.54	1.59	3.02	2.19
Information and communication	-24.96	5.98	3.93	2.34	4.61	2.03	2.49	1.76	1.25	-10.60	1.35	1.07
Financial and insurance activities	2.31	1.83	2.22	1.44	1.12	1.50	-3.78	1.75	1.31	-0.77	-0.68	3.84
Real estate activities (Ownership of Dwellings)	8.05	7.88	6.72	8.58	8.66	8.46	8.17	8.56	8.46	8.40	8.36	8.32
Public Administration and Social Security (General Government)	-4.27	6.26	7.60	10.35	6.61	10.57	11.84	-69.18	25.75	-5.35	-4.86	5.50
Education	1.21	-11.15	1.90	-11.69	5.24	8.47	4.90	-14.92	2.77	2.61	1.35	3.57
Human health and social work activities	3.65	4.05	3.62	2.06	4.37	2.43	3.16	7.14	7.65	2.02	5.19	5.53
Other Private Services	1.30	1.43	1.30	1.21	1.20	1.43	1.59	1.56	1.56	1.70	1.93	2.04
Total Economy	**3.86**	**3.96**	**3.90**	**3.57**	**2.84**	**4.66**	**-13.94**	**2.39**	**2.20**	**-50.67**	**4.11**	**3.87**

Appendix V: Incremental Capital Output Ratio (ICOR): Constant Capital Stock

Industries/Sectors	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Agriculture, forestry and fishing		**0.14**	**0.29**	**0.32**	**0.37**	**0.18**	**0.74**	**0.45**	**2.65**	**0.74**	**7.41**	**-2.51**	**0.54**	**0.60**
Crops		0.00	-0.01	0.42	0.53	0.04	17.76	0.13	-0.20	0.33	-0.32	-8.85	0.54	0.25
Cotton Ginning		0.35	0.66	0.29	1.32	-0.02	0.06	0.53	0.03	-0.26	-0.02	0.02	-0.01	0.03
Livestock		-0.02	0.12	0.34	0.37	0.41	0.41	0.79	0.92	1.06	0.71	0.72	0.62	0.83
Forestry		-0.28	-0.36	-0.12	-0.29	0.07	0.06	0.09	0.06	0.24	-0.13	0.32	-0.27	-0.11
Fishing		-2.57	-0.61	2.61	3.41	9.59	0.24	55.37	0.59	1.22	1.42	-0.05	0.31	1.34
Industrial Activities		**-0.22**	**-1.90**	**0.55**	**0.02**	**-0.01**	**1.95**	**0.38**	**0.31**	**-0.81**	**-0.49**	**-0.92**	**-1.36**	**-1.34**
Mining and quarrying		-0.62	-0.14	4.00	0.21	1.62	-1.66	-0.36	-0.91	1.59	1.54	0.60	-0.03	-2.55
Manufacturing		0.02	0.50	0.31	0.35	0.46	1.14	0.64	0.75	-0.68	-3.20	-2.63	-2.99	-0.49
i. Large Scale		*-0.05*	*0.49*	*0.25*	*0.33*	*0.44*	*1.24*	*0.63*	*0.79*	*-0.40*	*-14.44*	*-5.99*	*-9.90*	*-0.90*
ii. Small Scale (including Slaughtering)		0.52	0.54	0.57	0.62	0.71	0.50	0.76	0.59	0.54	0.54	0.54	0.56	0.50
Electricity, gas, and water supply		0.41	2.95	-9.01	-0.64	2.61	-0.02	2.03	-0.01	-2.58	0.70	0.11	3.35	-0.23
Construction		-0.93	6.19	-2.43	-18.50	0.04	0.13	0.28	0.12	-0.52	0.01	0.37	-0.66	-0.14
Services		**0.95**	**1.00**	**0.67**	**0.92**	**0.99**	**1.10**	**1.85**	**1.88**	**2.90**	**1.40**	**-0.77**	**0.67**	**0.38**
Wholesale and retail trade		0.31	0.77	0.26	0.16	0.14	0.20	0.31	0.34	-0.41	0.94	0.64	0.90	0.27
Accommodation and food service activities		0.67	0.59	0.58	0.51	0.48	0.42	0.84	0.79	0.76	0.75	0.74	0.75	0.69
Transportation and storage		0.81	1.45	0.29	1.23	1.40	1.48	0.48	0.88	-0.35	-0.23	-2.97	-1.72	-0.04
Information and communication		27.97	0.15	-3.40	2.37	4.49	4.82	5.28	3.00	-0.33	12.00	27.64	-2.78	-6.41
Financial and insurance activities		-0.04	0.69	0.39	0.40	0.18	0.30	0.84	0.57	-0.50	0.12	3.15	1.78	0.17
Real estate activities (Ownership of Dwellings)		4.02	4.34	4.80	4.48	4.70	3.07	4.08	3.78	3.54	3.45	0.04	3.49	2.86
Public Administration and Social Security		2.28	0.44	1.14	2.50	3.49	2.51	-17.97	70.40	-3.43	3.03	1.64	1.79	0.95
Education		0.77	0.34	0.49	0.78	2.16	0.41	6.38	1.18	0.74	-8.14	-0.31	-7.07	0.18
Human health and social work activities		0.37	0.35	0.91	2.17	2.59	1.54	0.68	3.97	0.76	1.09	2.07	0.85	0.46
Other Private Services		0.41	0.32	0.43	0.53	0.62	0.31	0.67	0.62	0.52	0.55	0.27	0.60	0.62
Total Economy		**0.60**	**0.54**	**0.57**	**0.50**	**0.58**	**1.16**	**1.21**	**1.33**	**3.97**	**1.00**	**-1.19**	**0.35**	**0.32**

Appendix V. Cont.

Industries/Sectors	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Agriculture, forestry and fishing	**0.61**	**1.00**	**3.76**	**0.89**	**0.55**	**1.96**	**0.40**	**0.53**	**0.49**	**-0.84**	**0.46**	**2.43**
Crops	-0.01	-0.48	0.01	1.08	0.39	-0.22	-0.02	0.13	0.16	28.75	0.03	0.00
Cotton Ginning	0.08	-0.01	0.00	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	-0.01
Livestock	0.88	0.65	1.06	0.86	0.70	0.68	0.89	1.05	1.13	0.65	1.00	1.96
Forestry	-0.42	0.04	-0.04	0.15	-0.17	-0.05	-0.09	-0.07	-0.29	-0.01	0.08	0.01
Fishing	1.31	0.23	0.36	0.88	0.65	1.28	1.66	1.54	3.17	1.81	7.64	7.12
Industrial Activities	**-0.54**	**0.25**	**0.87**	**0.90**	**0.69**	**18.97**	**-0.12**	**-0.01**	**-0.06**	**1.06**	**1.12**	**0.09**
Mining and quarrying	0.67	0.28	0.92	0.19	-0.68	-9.16	0.60	-3.20	0.73	0.70	-0.36	-1.52
Manufacturing	-0.64	-0.17	1.51	1.02	0.81	0.89	-0.19	0.07	0.02	0.60	-1.00	-0.85
i. Large Scale	*-1.04*	*-0.57*	*2.21*	*1.31*	*0.90*	*1.13*	*-0.04*	*-0.02*	*-0.06*	*0.41*	*-4.20*	*4.10*
ii. Small Scale (including Slaughtering)	0.52	0.52	0.44	0.48	0.52	0.54	1.44	0.40	0.34	-0.09	-0.09	0.12
Electricity, gas, and water supply	-3.33	1.38	0.57	0.51	3.45	5.14	1.31	0.39	-0.15	-1.30	-0.25	0.29
Construction	0.87	0.04	0.15	0.65	0.11	0.11	0.63	-0.92	0.13	0.20	1.22	0.42
Services	**0.78**	**1.18**	**1.06**	**1.15**	**1.25**	**0.68**	**-1.92**	**0.50**	**0.51**	**-97.46**	**0.21**	**1.20**
Wholesale and retail trade	0.21	0.39	0.24	0.18	0.28	0.73	-0.28	0.13	0.03	0.22	-0.11	1.85
Accommodation and food service activities	0.68	0.71	0.68	1.48	0.52	-0.15	-1.45	-1.33	-1.37	-1.75	-1.15	1.23
Transportation and storage	-0.28	0.45	1.32	1.04	1.75	0.18	0.42	0.09	0.17	-3.04	-2.13	-0.61
Information and communication	0.28	0.95	-1.30	-0.42	-1.31	-0.63	0.86	-0.53	0.26	15.26	-1.52	-0.46
Financial and insurance activities	-0.44	0.18	0.56	0.46	0.20	0.20	-0.37	0.26	0.13	0.04	-0.10	1.86
Real estate activities (Ownership of Dwellings)	3.20	3.14	2.68	3.52	3.62	3.58	3.47	3.76	3.70	-2.75	3.39	3.47
Public Administration and Social Security	-1.36	2.67	3.79	5.91	4.03	2.41	2.54	-18.03	9.55	-0.77	-0.01	1.95
Education	0.20	-2.87	0.57	-2.87	1.24	1.27	0.61	-3.59	0.30	-0.71	0.11	0.99
Human health and social work activities	-0.45	0.90	0.33	0.37	1.01	0.01	0.37	1.29	1.23	-0.12	0.76	1.86
Other Private Services	0.56	0.64	0.58	0.47	0.41	0.40	0.25	0.22	0.12	-0.24	0.47	0.72
Total Economy	**0.45**	**0.91**	**1.07**	**1.07**	**0.98**	**1.06**	**-1.95**	**0.37**	**0.39**	**16.28**	**0.27**	**1.01**

Appendix-VI: Field Data Collection Questionnaire

The information collected in this survey will strictly be treated Confidential and will be only used to produce aggregate/average tabulation. No data for individuals and organizations will be published or made available to any other private/government agencies in any form. The data will be used for statistical purpose only

SECTION -1: PARTICULARS OF ESTABLISHMENT

101. Processing Code: ☐☐☐☐☐☐☐☐☐☐

102. Serial No. of Establishment: ☐☐

103. Title of Establishment (Optional): _____

104. Name of Owner(s) (Optional): _____

105. Gender of the owner (Optional): Male ☐ Female ☐

106. Province:_____ 107. District:_____108. Tehsil: _____ 109. City:_____ 110. Village:_____

111. Name of Respondent:_____ 112. Designation of Respondent:_____

113. Telephone/Mobile:_____ 114. E-Mail: _____ 115. Website:_____

116. Year of Commencement of Activity ☐☐☐☐

117. Kind of Major Activity (please tick the appropriate code**)**

Agriculture **1** Industrial Activity **2** Services **3**

118. Description of Activity:

	Code (PSIC-2010)					

119. Average number of employees ☐

Section-2 Expected Life of Assets and Scrap Value

Type of Assets			Expected Life of Asset in (Years)	Scrap Value of Asset in '000' Rupees
201	Dwellings (Residential buildings)			000
Other Buildings and	202	Buildings other than dwellings e.g. schools, shops, etc.		000
	203	Other structures		000
	2031	Telephone/Power lines, Pipelines, Cables etc.		000
	2032	Roads		000
	2033	Sewer highways, bridges		000
Equipment	205	Transport Equipment (vehicles etc.)		000
	2051	Vans		000
	2052	Buses		000
	2053	Trucks		000
	2054	Taxies		000
and	206	Computers and peripheral equipment e.g. desktop computers, laptops, tablets, servers		000
	807	Communication equipment e.g. telephones, mobile phones, landline systems, networking devices		000
Machinery	808	Consumer electronic equipment e.g. televisions, radios, audio systems, video recorders, cameras		000
	809	Furniture & Fixture		000
	810	Other machinery and equipment n.e.c. weighing, filtering, packing, gear-cutting & welding machines, etc.		000
Cultivated Biological Assets				
	811	Trees (Mango, orange, etc.)		000

	812	Animals (Cattle, sheep, goat, etc.)		000
Intellectual Property	813	Research and Development		000
	814	Computer software and database		000
	815	Other intellectual property products copyrights, patents, trademarks, etc.		000
200	**Total**			000

Official Seal of Organization/Company (Optional): Signature (Optional): ……..……..……..

Appendix-VII: Instructions for Field Data Collection

Introduction and Objectives

This data collection is for the research project titled '***Analysing Sector-Specific Flows of Fixed Investment and Measuring Stock of Physical Capital in Pakistan***' under the Research for Social Transformation and Advancement (RASTA), Competitive Grants Programme (CGP) (Round 7.0) being implemented by the Pakistan Institute of Development Economics (PIDE), Islamabad.

The research project will analyze the trends in flows of nominal and real fixed investments in the private and public sectors as well as investment-to-GDP ratios not only for major industries e.g. agriculture, industrial activities, and services but also for detailed economic activities e.g. crops, livestock, forestry, fishing, mining, manufacturing etc. The project also aims to compile industry-wise nominal and real stock of fixed capital following linear and geometric methods. The statistics on capital stock will subsequently be used to compile industry-specific consumption of fixed capital, which in turn, enable the compilation of net aggregates for the economy of Pakistan, a missing link in the currently available macroeconomic aggregates, including Net Value Added, Net National Income, Net Fixed Capital Formation, etc. Finally, the project will also enable the longer-term analysis of industry-specific capital-output ratios and trends in nominal and real value-added growth.

Confidentiality of the collected data

"The information collected in this survey will strictly be treated ***"Confidential"*** and will be only used to produce aggregate/average tabulation. No data for individuals and organizations will be published or made available to any other private/government agencies in any form. The data will be used for statistical purpose only".

Section and Item-wise instructions

SECTION -1: Particulars of Establishment

101. Processing Code:

Coding Scheme for the Survey

A 4-digit unique processing code has been introduced for each establishment covered in the survey. Details are given as under:

Position-I: One-digit processing code at Position-I will be assigned to the four provinces of Pakistan, as under:

Province	Code
Khyber Pakhtunkhwa	1
Punjab	2
Sindh	3
Baluchistan	4
Islamabad	5

Position-II: One-digit processing code at Position-II will be assigned to each station as follows:

Province	Code	Station	Code
KP	1	Peshawar	1
		Haripur/Hattar Industrial Area	2
Punjab	2	Lahore	1
		Faisalabad	2

		Multan	3
		Gujranwala	4
		Sialkot	5
Sindh	3	Karachi	1
		Hyderabad	2
		Sukkur	3
Balochistan	4	Quetta	1
		Hub Industrial Area	2
ICT	5	Islamabad	1

Position-III & IV

A two-digit processing code at position III & IV will be assigned to show the number of establishment. For example, first, second and third establishment from a station will be assigned codes of 01, 02, and 03 respectively and so on.

102. Serial No. of Establishment: | | |

A two-digit Serial No will be assigned to each establishment. For example, first, second and third establishment from a station will be assigned Serial Numbers of 01, 02, and 03 respectively and so on. In this way last two digits of the processing code in Question '101' and serial numbers of establishment in Question '102' will be the same.

103. Title of Establishment (Optional): Self-explanatory

104. Name of Owner(s) (Optional): Self-explanatory

105. Gender of the owner (Optional): Male = 1 Female = 2

106 - 110. Province: Self-explanatory, 107. District: Self-explanatory, 108. Tehsil: Self-explanatory,

109. City: Self-explanatory 110. Village: Self-explanatory

111. Name of Respondent: Self-explanatory, 112. Designation of Respondent: Self-explanatory

113. Telephone/Mobile: Self-explanatory 114. E-Mail: Self-explanatory 115. Website: Self-explanatory

116. Year of Commencement of Activity | | | | |

The year when a business started its operations, will be recorded here.

117. Kind of Major Activity (please tick the appropriate code**).** One out of three options will be ticked following the nature of business/activity of the establishment/organization.

Agriculture **1** Industrial Activity **2** Services **3**

118. Description of Activity:

	Code (PSIC-2010)					

The nature of business operations or major types of activity will be described in the provided space. Then relevant industrial codes from the Pakistan Industrial Classification (PSIC)-2010 adopted from the International Standard Industrial Classification (ISIC) Rev. 4 will be recorded here.

119. Average number of employees: Average number of employees including working proprietors, managers/ supervisors, un-paid family workers, sales/support staff and service workers will be recorded here.

Section-2 Expected Life of Assets and Scrap Value

Expected life of assets

The useful life of an asset is an estimate of the number of years it will remain in profitable service. The purpose of a useful life estimate is to determine how long an asset will remain in useable condition. The expected life of assets in capital stock calculation is estimated using a combination of factors, including historical data, asset type, and industry-specific knowledge.

Scrap Value

In the context of capital stock calculation (or depreciation), scrap or residual value refers to the estimated worth of an asset at the end of its useful life. It's essentially the value remaining after the asset has been fully depreciated. This value is also known as salvage value or break-up value. t's not the actual selling price but rather an estimate of what the asset might fetch when it's no longer in use. It's the anticipated value when the asset's primary purpose is no longer being served.