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Policy Brief

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

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INTRODUCTION

Sustainable economic growth in Pakistan, as in other developing nations, is fundamentally driven by investment in the labor force, physical capital, and reliable energy sources. Developing human and physical capital directly enhances output growth, efficiency, and productivity. Despite the clear significance of these investments for long-term economic stability and innovation, Pakistan's Gross Fixed Capital Formation (GFCF) growth has been slower than that of its South Asian peers. This is evident in the stark difference in the average investment-to-GDP ratio from 2000 to 2024: Pakistan's average was merely 15.8%, substantially lower than the South Asian regional average of 32.0%, which includes figures of 28.1% for Bangladesh, 29.3% for Sri Lanka, 30.2% for Nepal, and 34.0% for India.

The stock of physical capital in an economy is built through continuous flows of gross fixed capital formation (GFCF), which includes investments in buildings, machinery, ICT, and intellectual property products such as R&D and software. Although GFCF is a widely recognized measure of physical capital in the economic literature, researchers have identified significant limitations in relying solely on gross investment data, primarily because it lacks details on depreciation rates and the existing capital stock. Consequently, these figures cannot accurately estimate net investment. To overcome these challenges and derive a more precise valuation of the capital stock at the national level, many contemporary studies employ the Perpetual Inventory Method (PIM). By cumulating past investment flows and adjusting for the consumption of fixed capital over time, the PIM enables researchers to estimate the current stock of assets in use in the economy.

While the United Nations and OECD emphasize capital statistics as vital for productivity analysis, the Pakistan Bureau of Statistics (PBS) does not produce capital stock estimates; it publishes only Gross Fixed Capital Formation (GFCF) data. This study addresses this data gap by using a consistent GFCF time series from 2000 to 2025, with 2015-16 as the reference year. By incorporating intellectual property products as recommended by the System of National Accounts (SNA), the study provides nominal and real capital stock estimates for major sectors—including agriculture, industry, and services—using both linear and geometric methodologies. Ultimately, these new statistics enable the

calculation of fixed capital consumption, allowing more accurate comparisons of net value-added growth across diverse economic activities.

The study's primary purpose is to provide a comprehensive analysis of fixed investment and capital stock dynamics across various industries in Pakistan. The research aimed to achieve specific objectives, including analyzing trends in fixed investment and their corresponding investment-to-GDP ratios at the industry level. Furthermore, it sought to compile nominal and real fixed capital stock estimates, as well as consumption of fixed capital estimates, using both linear and geometric methods across sectors. Finally, the study intended to compile and analyze industry-specific capital-output ratios. These objectives were addressed through research questions investigating the growth of fixed investment over time, variations in capital stock and consumption of fixed capital across industries, and differences in capital-output ratios.

METHODOLOGY

In accordance with SNA-2008 and OECD (2009) standards, this study uses the PIM to estimate capital stock and consumption of fixed capital. This approach requires a comprehensive, long-term time series of Gross Fixed Capital Formation (GFCF) categorized by industry and asset type. To ensure reliability and consistency, the estimation further incorporates critical variables, including the useful lives of diverse asset types, relevant price indices, and residual values, as mandated by the SNA.

Capital Stock: 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 becomes $X \times p$ after 1 year of service, and $X \times p^2$ after 2 years of service, and so on. Similarly, it becomes $X \times pn\ after\ n$ 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 base 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 using the following identity:

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

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

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

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

Valuation of Capital Stock: In compiling capital stock statistics, valuation is a key consideration. Stock can be valued at historic acquisition prices or at reference period prices. For the current study, capital stock estimates were valued using the base year of Pakistan's national accounts (2015-16). Industry-specific asset service lives were used to determine depreciation rates under the linear method. In contrast, for the geometric method, both asset residual values and service lives were used to derive depreciation functions.

Initial capital stock: To address the challenge of missing initial capital values in the PIM, researchers employ several distinct approaches. The Accounting Approach uses firm-level book values as a starting point, though it often fails to account for age-efficiency profiles. The Steady State and Disequilibrium approaches derive initial stock from current investment levels and depreciation. However, they are criticized for overreliance on short-term output or investment growth rates, respectively. To ensure greater accuracy, this study adopts a Synthetic Time Series Approach. Following the IMF (2017) guidelines, this method uses actual historical investment data rather than artificial growth assumptions to construct a more reliable and consistent capital stock series.

Data collection methodology: A mixed-methods approach was used. Secondary data on GFCF were obtained from the Ministry of Finance, the Pakistan Bureau of Statistics, and the State Bank of Pakistan. Due to limited information on average asset lives and residual values, primary data were collected through questionnaires in various cities, and annual company reports were also used to extract relevant information.

KEY FINDINGS

The study shows that Pakistan's average real gross fixed capital formation (GFCF) growth rate was 2.80% between 2000 and 2025, yielding an average investment-to-GDP ratio of 14.58%. This ratio significantly underperforms the South Asian regional average of 32.0%, as well as those of neighboring India (34.0%) and Bangladesh (28.1%). This low investment level is a key factor in Pakistan's slower average economic growth rate of 3.91% during the same period, which lags behind the region's average of 6.1%.

Sector-wise, average real fixed investment growth varied: 2.4% in agriculture, 0.8% in industry, and 4.5% in services. Consequently, investment-to-GDP ratios were 12.4%, 17.8%, and 14.6%, respectively. More recently (2019-2025), real fixed investment across the entire economy contracted by 1.9%, with industry and services declining by 7.3% and 1.1%, respectively. This contraction poses serious risks to Pakistan's future productive capacity, innovation, and export competitiveness.

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Using both linear and geometric methods, the study measures Pakistan's real net capital stock growth from 2000 to 2025. Agriculture grew at 1.7%–1.9% on average, while industry lagged at 1.0%–1.2%, experiencing multiple contractions (notably FY 2001, FY 2010–14, and FY 2021–23). The services sector outperformed the others, growing at 4.4%–4.5%, contributing to a national average of 3.2%. The national capital stock contracted in FY 2011 and FY 2023 but peaked during the high-growth periods of FY 2006–08 (6.5%) and FY 2016–18 (6.0%).

In addition to analyzing capital stock, the study evaluated investment efficiency using the Incremental Capital-Output Ratio (ICOR) across various economic sectors from FY 2000 to 2025. While Pakistan maintained a long-term average ICOR of 1.40, this figure masks extreme volatility in capital productivity. The ratio ranged from a high of +15.9 in FY 2009, indicating significant investment inefficiency, to a sharp decline of -50.6 in FY 2023, a period marked by economic contraction when output fell despite capital inputs. These wide swings underscore the inconsistent use of physical assets and the impact of macroeconomic instability on the country's productive efficiency. However, excluding outliers raises the average ICOR to 3.80. This higher ICOR indicates that Pakistan’s underlying investment efficiency is weaker and more volatile than the headline long-term average suggests.

CONCLUSION

Low levels of investment, particularly relative to regional averages, are linked to slower economic growth. A sustained lack of investment can hinder a country's ability to build productive capacity, innovate, and compete in global markets. Contraction in investment across key economic sectors further risks undermining future economic potential.

Pakistan’s capital stock expansion has been inconsistent, with growth patterns varying widely across sectors. While the services sector has shown the most resilience and steady progress, industrial development has been hampered by frequent stagnation and decline. These fluctuations, marked by occasional peaks in national capital accumulation followed by sharp contractions, suggest that the country’s productive foundation is sensitive to broader economic cycles. Ultimately, uneven growth across agriculture and industry indicates a lack of sustained, long-term deepening of the nation's physical and infrastructure assets.

Over a significant period, evaluations of investment efficiency across various economic sectors show fluctuations in the effectiveness with which capital is converted into output. While there may be periods when overall efficiency shows a long-term trend, this can be obscured by substantial swings that reflect inconsistent links between investment and actual economic benefits. Broader economic conditions and the utilization of physical assets can influence these variations. Therefore, focusing solely on capital investment without considering these underlying factors may not consistently lead to sustained growth or improved productivity.

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KEY POLICY RECOMMENDATIONS

As a capital-deficient nation with the lowest investment-to-GDP ratio in the region, Pakistan requires a robust data framework to revitalize its economy. By establishing comprehensive nominal and real capital stock statistics, this study provides a vital measure of national wealth and lays the groundwork for future analyses of industrial productivity and efficiency. These estimates enable more accurate calculation of fixed capital consumption, which not only refines the compilation of net economic aggregates but also enhances the recorded value-added of essential public services, including education, healthcare, and general government operations. Crucially, these findings can bridge a long-standing gap in the Pakistan Bureau of Statistics' National Statistical System by enabling the compilation of GDP using the income approach. Ultimately, this data serves as a cornerstone for evidence-based policy formulation, providing the precision needed to implement and evaluate strategies that drive sustainable investment growth.