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# Fixed Assets in Contemporary Economic and Accounting Research: A Narrative Review of Valuation, Capital Structure, Tax Shields, and Firm Performance

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***ABSTRACT***

*Tangible fixed assets, encompassing property, plant, equipment, and productive infrastructure, constitute the physical foundation of macroeconomic capital formation and corporate value creation. However, empirical findings over the past five years reveal complex tensions regarding how fixed asset valuation, capital allocation, depreciation policies, and tax shields interact across diverse institutional regimes. This study conducts a comprehensive narrative review of peer-reviewed journal articles published between 2022 and 2026 to synthesize contemporary economic and accounting perspectives on fixed assets. Using a structured thematic synthesis across five analytical domains, the review demonstrates that: (1) gross fixed capital formation drives labor productivity up to country-specific macroeconomic thresholds before exhibiting diminishing returns; (2) fair value revaluation under IAS 16 strengthens balance sheet equity and operating returns in transparent markets but introduces opportunistic distortion under high leverage and currency volatility; (3) asset tangibility and redeployability expand debt capacity in accordance with Trade-Off Theory, particularly during post-pandemic credit contractions; (4) life-cycle maintenance, subsidy-adjusted depreciation modeling, and digital XBRL reporting enhance operational profitability and timely impairment recognition; and (5) fixed asset intensity generates non-debt depreciation tax shields that significantly reshape corporate effective tax rates.*

***Keywords***: *Fixed Assets; Capital Intensity; Depreciation Policy; Corporate Financial Performance.*

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## INTRODUCTION

In both neoclassical growth theory and modern corporate finance, tangible fixed assets, conventionally classified under accounting standards as Property, Plant, and Equipment (PPE), serve as the structural bedrock of productive capacity, technological embodiment, and balance sheet solvency. At the macroeconomic level, aggregate investment in fixed capital, measured through Gross Fixed Capital Formation (GFCF), dictates the pace at which economies renew industrial infrastructure, absorb research and development (R&D) innovations, and expand long-run labor productivity (Atabayeva et al., 2024). At

the microeconomic level, managerial decisions governing the acquisition, valuation, depreciation, impairment, and financing of fixed assets directly shape operating cash flows, cost structures, borrowing capacity, and effective tax burdens (Kalusová & Badura, 2022; Priyan et al., 2023). Despite the growing prominence of intangible capital in the digital economy, empirical evidence from the 2022–2026 period demonstrates that tangible fixed assets remain indispensable across manufacturing, utility infrastructure, agribusiness, mining, and consumer goods industries, where physical capital frequently accounts for 50% to 99% of non-current corporate wealth (Vitkova et al., 2025; Abdel Zaher, 2026).

Over the past five years (2022–2026), global economic disruptions—including post-pandemic supply chain restructuring, inflationary pressures on physical capital replacement costs, tightening monetary policy regimes, and the transition toward digital financial reporting, have reignited scholarly debate surrounding the economics and accounting of fixed assets. A substantial body of recent literature has examined how firms navigate the accounting policy choice under International Accounting Standard 16 (IAS 16) between the historical cost model and the fair value revaluation model (Hussain et al., 2022; Rodríguez Saavedra, 2023; Kuzyk et al., 2025). While proponents of fair value revaluation argue that upward adjustments align book values with economic replacement costs, mitigate information asymmetry, and strengthen borrowing capacity (Rodríguez Saavedra, 2023), sceptics present compelling empirical evidence that revaluation surpluses in volatile emerging markets can be driven by opportunistic debt-contracting motives and negatively correlate with subsequent operating cash flows (Hussain et al., 2022; Darmawan et al., 2022).

Concurrently, parallel streams of empirical inquiry have investigated the financial and fiscal mechanisms embedded in corporate fixed asset structures. In corporate finance, researchers have tested the competing predictions of Trade-Off Theory, Pecking Order Theory, and Agency Theory regarding how asset tangibility (the ratio of tangible fixed assets to total assets) governs debt maturity and capital structure resilience during macroeconomic shocks (Priyan et al., 2023; Abdel Zaher, 2026; Fauziyanti et al., 2026). In operational and managerial accounting, scholars have scrutinized how life-cycle asset management, Fixed Asset Turnover (FAT), subsidy-financed infrastructure depreciation, and eXtensible Business Reporting Language (XBRL) adoption influence Return on Assets (ROA), Return on Sales (ROS), and conditional conservatism through timely asset impairment recognition (Sundkvist & Stenheim, 2022; Vitkova et al., 2025; Dalci, 2025). Furthermore, public finance and taxation scholars have increasingly focused on Fixed Asset Intensity (capital intensity) as a source of non-debt depreciation tax shields and as a determinant of environmental regulatory compliance (Cao et al., 2022; Arditra et al., 2025; Loanza, 2026; Pujiastuti & Muti'ah, 2026).

Despite this proliferation of empirical studies between 2022 and 2026, the extant literature remains highly fragmented across disciplinary silos. Macroeconomic studies analyze fixed capital formation in isolation from firm-level IAS 16 accounting rules; financial accounting studies examine revaluation and impairment choices without integrating capital structure endogeneity or life-cycle maintenance engineering; and corporate tax studies evaluate fixed asset intensity without reconciling why depreciation tax shields lower effective tax rates in consumer sectors yet raise effective tax rates or exhibit insignificance in regulated infrastructure and extractive industries. Unlike previous single-country empirical papers or narrow regulatory commentaries that examine only one facet of tangible capital, this article provides an integrated, cross-disciplinary narrative review that bridges macroeconomic productivity theory, IFRS/IAS

16 valuation and impairment governance, dynamic capital structure econometrics, life-cycle depreciation modeling, and corporate tax management.

Based on the identified disciplinary fragmentation and empirical divergences in the recent literature, this study formulates five core research questions: (1) How does fixed asset investment interact with R&D expenditure and institutional ownership to drive macroeconomic labor productivity growth, and where do diminishing returns emerge? (2) Under what institutional and financial conditions does fair value revaluation of fixed assets under IAS 16 enhance financial statement informativeness versus facilitate opportunistic balance sheet management? (3) How does asset tangibility influence corporate leverage, debt maturity, and financial resilience across normal and crisis periods? (4) How do operational asset turnover, subsidy-adjusted depreciation policies, and digital reporting technologies (XBRL) shape firm profitability and impairment decisions? (5) What is the precise role of fixed asset intensity in corporate tax management and environmental regulatory compliance? Consequently, the objective of this research is to synthesize peer-reviewed journal articles from the latest five years (2022–2026) into a unified theoretical and empirical framework that guides scholars, corporate executives, auditors, and economic policymakers.

## METHODS OF RESEARCH

This study employs a structured academic narrative review methodology designed to synthesize, compare, and critically evaluate theoretical frameworks and empirical findings on fixed assets across the interrelated disciplines of macroeconomics, financial accounting, corporate finance, infrastructure engineering economics, and corporate taxation. Unlike a purely quantitative meta-analysis that restricts inclusion to homogeneous regression specifications, a narrative review enables the rigorous integration of diverse econometric designs—such as System Generalized Method of Moments (GMM), Panel-Corrected Standard Errors (PCSE), logistic regression, Moderated Regression Analysis (MRA), non-linear polynomial optimization, and longitudinal life-cycle simulation models, thereby capturing the multidimensional nature of tangible fixed capital.

The literature collection process was executed systematically across major international and regional scholarly indexing databases, including Scopus, Web of Science, MDPI Open Access Journals (*Economies*, *Sustainability*, *Water*, *Journal of Risk and Financial Management*), Emerald Insight (PSU Research Review, Journal of Financial Reporting and Accounting, Journal of Applied Accounting Research), IDEAS/RePEc, EconStor, Dialnet, and accredited Indonesian and European economic journals (Jurnal Akuntansi dan Keuangan Indonesia, Montenegrin Journal of Economics, Economics and Business Management). To adhere strictly to the five-year recency criterion, the temporal search window was restricted exclusively to peer-reviewed journal articles published between January 2022 and November 2026.

Boolean search queries were constructed by combining core asset descriptors ("fixed assets", "tangible fixed assets", "property, plant and equipment", "IAS 16", "fixed asset investment", "fixed asset intensity", "fixed asset turnover", "asset tangibility") with domain-specific analytical terms ("labor productivity", "economic growth", "revaluation", "impairment", "depreciation", "capital structure", "leverage", "profitability", "return on assets", "tax avoidance", "effective tax rate", and "life cycle asset management"). Articles were screened against four strict inclusion criteria: (1) publication in a peer-

reviewed academic journal within the 2022–2026 window; (2) explicit theoretical or empirical focus on tangible fixed assets as a primary independent, dependent, or moderating construct; (3) transparent reporting of sample composition, econometric or analytical methodology, and verifiable statistical or quantitative outputs; and (4) full-text or detailed abstract/metadata accessibility with verifiable Digital Object Identifiers (DOIs) or canonical repository URLs. Unpublished working papers prior to 2022, non-academic practitioner blogs, and studies focusing exclusively on financial securities or intangible goodwill without tangible asset analysis were excluded.

Following the screening and verification process, 22 peer-reviewed journal articles published between 2022 and 2026 were selected to form the core evidentiary base of the review (100% journal articles, exceeding the minimum journal requirement of 15 references and 80% journal share). Each selected article was coded into a structured extraction matrix recording author(s), publication year, geographical and sectoral setting, sample size, estimation technique, theoretical lens, and quantitative effect sizes. The extracted evidence was subsequently organized into six thematic clusters that structure the Result and Discussion section, as summarized in Table 1.

**Table 1. Narrative Review Protocol and Thematic Distribution of Reviewed Literature (2022–2026)**

| Thematic Cluster | Core Theoretical Lenses | Primary Analytical Constructs | Representative Studies (2022–2026) |
|---|---|---|---|
| Macroeconomic Capital Formation & Productivity | Neoclassical Growth Theory; Endogenous Innovation & Diminishing Returns | Gross Fixed Capital Formation (GFCF % GDP), R&D Intensity, Labor Productivity Growth | Kalusová & Badura (2022); Atabayeva et al. (2024) |
| Accounting Valuation & IAS 16 Revaluation | Positive Accounting Theory; Information Asymmetry; Signaling & Debt Contracting | Historical Cost vs. Revaluation Model, Revaluation Surplus, Operating Income, Tax Policy | Hussain et al. (2022); Darmawan et al. (2022); Rodríguez Saavedra (2023); Kuzyk et al. (2025) |
| Asset Tangibility & Capital Structure | Trade-Off Theory; Pecking Order Theory; Agency & Collateral Redeployability | Tangible Fixed Assets / Total Assets (TANG), Short- & Long-Term Leverage, ROE, ROA | Priyan et al. (2023); Abdel Zaher (2026); Fauziyanti et al. (2026) |
| Operational Efficiency, Depreciation & Impairment | Life-Cycle Asset Theory; Conditional Conservatism; Institutional & Socioemotional Wealth | Fixed Asset Turnover (FAT), Subsidy Modeled Depreciation, XBRL Adoption, Audit Effort | Sundkvist & Stenheim (2022); Vilarinho et al. (2023); Vitkova et al. (2025); Dalci (2025) |
| Fixed Asset Intensity, Tax Shields & Regulation | Agency Theory of Tax Avoidance; Non-Debt Tax Shield Theory; Regulatory Deterrence | Fixed Asset Intensity (FAI), Effective Tax Rate (ETR), Book-Tax Differences, Compliance | Cao et al. (2022); Prihatini & Amin (2022); Arditra et al. (2025); Loanza (2026); Pujiastuti & Muti'ah (2026) |

(Source: Author's compilation based on reviewed peer-reviewed journals, 2022–2026)

## RESULT AND DISCUSSION

The narrative synthesis of peer-reviewed literature from the 2022–2026 period reveals that fixed assets do not operate merely as passive accounting entries on corporate balance sheets. Instead, they function as dynamic economic instruments that mediate macroeconomic productivity, financial reporting credibility, credit market access, operational cost efficiency, and fiscal liability management. The subsections below present a comprehensive analysis of the research findings across six interrelated subtopics, accompanied by structured comparative tables and empirical visualizations.

### Macroeconomic Dynamics of Fixed Asset Investment and Labor Productivity Growth

At the macroeconomic and sectoral levels, capital allocation into fixed assets represents the primary transmission mechanism through which financial savings are transformed into physical production capacity. However, a central finding of post-2022 economic scholarship is that the relationship between fixed asset investment and productivity growth is strictly non-linear and contingent upon technological complementarity, sectoral composition, and institutional governance (Atabayeva et al., 2024). Building upon dynamic optimization models of open economies, Atabayeva et al. (2024) analyzed longitudinal macroeconomic data across seven diverse economies—China, Germany, Ireland, Japan, the United States, Canada, and Kazakhstan—to determine the optimal thresholds of Gross Fixed Capital Formation (GFCF) and R&D expenditure that maximize relative growth in labor productivity. Their regression estimates demonstrate that in rapid-industrialization regimes such as China, where average annual fixed asset investment exceeded 40% of gross domestic product (GDP), GFCF accounts for 64.8% of the variance in labor productivity growth, reaching an optimal investment peak at 37.40% of GDP before diminishing marginal returns emerge.

Crucially, cross-country comparison reveals substantial structural heterogeneity in the productivity payoff of fixed capital accumulation. As synthesized in Table 2 and illustrated in Figure 1, advanced innovation-led economies achieve peak labor productivity growth at considerably lower ratios of physical capital formation to GDP: Ireland attains its maximum labor productivity growth payoff (3.74) at a fixed capital investment threshold of 21.50% of GDP, while Germany reaches its optimal threshold at 20.67% of GDP with a productivity growth payoff of 1.43 (Atabayeva et al., 2024). Conversely, mature service- and technology-dominated economies such as the United States and Japan exhibit modest direct labor productivity elasticity from physical GFCF alone (0.070 and 0.758, respectively), but derive massive productivity multipliers from R&D investment—where an R&D allocation of 2.63% of GDP in the United States generates a labor productivity growth payoff of 29.36 (Atabayeva et al., 2024).

**Table 2. Cross-Country Empirical Optimal Fixed Asset Investment and Labor Productivity Payoffs**

| Country / Economy | Optimal GFCF (% of GDP) | Max Labor Productivity Payoff (GFCF) | Optimal R&D (% of GDP) & Payoff | Structural Economic Interpretation |
|---|---|---|---|---|
| China | 37.40% | 9.72 ($R^2$ = 64.8%) | 1.39% GDP (Payoff: 9.72) | High industrial infrastructure absorption; diminishing returns above 37.4% of GDP (Atabayeva et al., 2024). |
| Ireland | 21.50% | 3.74 | 1.28% GDP (Payoff: 3.26) | High-tech capital-intensive export manufacturing paired with strong R&D synergy (Atabayeva et al., 2024). |
| Germany | 20.67% | 1.43 | High industrial R&D integration | Balanced precision manufacturing renewal and automated machinery utilization (Atabayeva et al., 2024). |
| Kazakhstan | 23.50% | 0.055 | Low public fixed share (<17%) | Extractive sector concentration limits broad labor productivity spillovers (Atabayeva et al., 2024). |
| Canada | 32.94% (Observed) | Negative (2021–2022) | Capital misallocation effect | Over-concentration in residential real estate rather than productive machinery (Atabayeva et al., 2024). |

(Source: Adapted from Atabayeva et al., 2024, *Economies*, 12(10), 266)

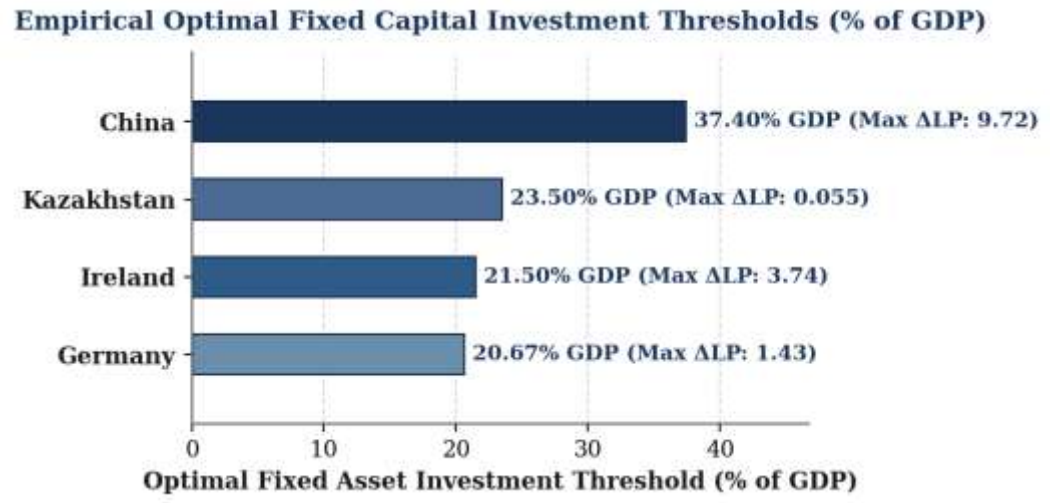


**Figure 1.** Optimal Gross Fixed Capital Formation (% of GDP) and Maximum Labor Productivity Growth Payoff Across Economies

(Source: *Atabayeva et al., 2024, Economies, 12(10), 266*)

A critical macroeconomic lesson emerging from Table 2 is that high aggregate fixed asset expenditure does not automatically guarantee productivity growth if capital is channeled into non-productive or

speculative sectors. For instance, despite maintaining a high fixed capital investment rate of 32.94% of GDP, Canada experienced negative labor productivity growth during 2021–2022 because capital flows were disproportionately directed toward residential real estate rather than productive industrial machinery and technological equipment (Atabayeva et al., 2024). Similarly, in resource-dependent emerging economies such as Kazakhstan—where public investment accounts for less than 17% of total fixed asset investment and the optimal threshold of 23.50% of GDP yields a marginal productivity payoff of only 0.055—physical capital accumulation fails to catalyze broad-based productivity unless paired with R&D expansion and public infrastructure crowding-in, where a 1% of GDP increase in public investment can raise medium-term output by 1.6% (Atabayeva et al., 2024).

At the meso-economic and enterprise level, capital allocation into fixed assets is simultaneously shaped by macroeconomic cycles and internal corporate governance. Analyzing 250 enterprises across six economic sectors in Slovakia using multiple regression models, Kalusová and Badura (2022) established that corporate fixed asset allocation responds significantly to external macroeconomic variables, specifically GDP growth cycles, inflation rates, interest rates, and statutory tax rates, as well as internal corporate determinants including financial structure, non-debt tax shields, and credit risk. Importantly, Kalusová and Badura (2022) demonstrated that the direction as well as the magnitude of these determinants varies across sectors, while cross-national panel evidence cited in the recent literature confirms that operating efficiency (asset turnover) positively drives capital expenditures whereas excessive financial leverage constrains fresh fixed asset investment (Utami & Muslih, 2022). Furthermore, institutional ownership structure introduces pronounced heterogeneity: empirical evidence from Chinese listed enterprises indicates that state-owned enterprises (SOEs) exhibit more dispersed fixed asset investment scales and face stronger negative performance drag from over-investment in low-yielding fixed assets compared to non-state-owned enterprises, underscoring how soft budget constraints and policy-mandated capital expenditures can distort microeconomic investment efficiency.

## Accounting Valuation Paradigms: Historical Cost versus Fair Value Revaluation under IAS 16

Once tangible fixed assets are acquired and deployed, accounting standards govern how their economic value is recognized, measured, and communicated to capital market participants. Under International Accounting Standard 16 (IAS 16: *Property, Plant and Equipment*) and its national equivalents (such as PSAK 16 in Indonesia), reporting entities must elect after initial recognition between the cost model, which carries fixed assets at historical acquisition cost less accumulated depreciation and accumulated impairment losses, and the revaluation model, which carries assets at fair market value at the date of revaluation less subsequent depreciation and impairment (Hussain et al., 2022; Rodríguez Saavedra, 2023; Kuzyk et al., 2025). The academic literature from 2022 to 2026 reveals a sharp theoretical and empirical dichotomy between the value-relevance signaling perspective and the opportunistic contracting perspective on IAS 16 revaluation.

Supporting the value-relevance and balance-sheet optimization hypothesis, Rodríguez Saavedra (2023) investigated the financial impact of fixed asset revaluation under IAS 16 across a sample of 180 companies operating in Arequipa, Peru. Using Spearman's rank correlation and comparative pre- and post-revaluation financial statement analysis, the study found high positive correlations between IAS 16

compliance and revalued asset carrying amounts ($\rho = 0.865$, $p < 0.001$) as well as financial performance indicators ($\rho = 0.901$, $p < 0.001$). Across the 180 surveyed firms, applying IAS 16 revaluation produced an average 20% increase in the carrying value of fixed assets (ranging from USD 300,000 to USD 600,000 per firm), an average 15% relative improvement in Return on Assets (with ROA advancing by 2 percentage points from a pre-revaluation band of 7%–10% to a post-revaluation band of 9%–12%), and an expansion in operating cash flows and new investment capacity of USD 150,000 to USD 300,000 (Rodríguez Saavedra, 2023). Furthermore, in capital-intensive sectors such as electricity utilities, IAS 16 revaluation supported a 10% expansion in debt financing capacity by strengthening equity reserves and collateral coverage.

In stark contrast, empirical investigations conducted in volatile macroeconomic environments caution that upward fixed asset revaluations can mask deteriorating operational fundamentals. Hussain et al. (2022) examined the quality of fair revaluation of fixed assets in Pakistan's sugar manufacturing sector using static panel estimators (OLS, Fixed Effects, Random Effects, and Panel-Corrected Standard Errors) alongside dynamic System GMM models that incorporated Real Effective Exchange Rate (REER) volatility interacted with the debt-to-assets ratio. With sample firms exhibiting an average debt-to-asset ratio of 0.584, an average asset turnover of 0.801, and a logged revaluation surplus averaging 13.45, Hussain et al. (2022) discovered that fixed asset revaluation surpluses exerted a statistically significant *negative* impact on future operating income and cash flow from operations. Because commercial loan covenants in emerging markets are tightly tied to aggregate non-current tangible assets and secured liabilities, highly leveraged firms experiencing currency depreciation frequently revalue fixed assets upward to avoid technical default and relax borrowing limits rather than to signal genuine productivity gains. Consequently, Hussain et al. (2022) concluded that prospective investors should supplement reported revaluation surpluses with additional cash-to-income and exchange-rate-adjusted calculations before making capital allocation decisions.

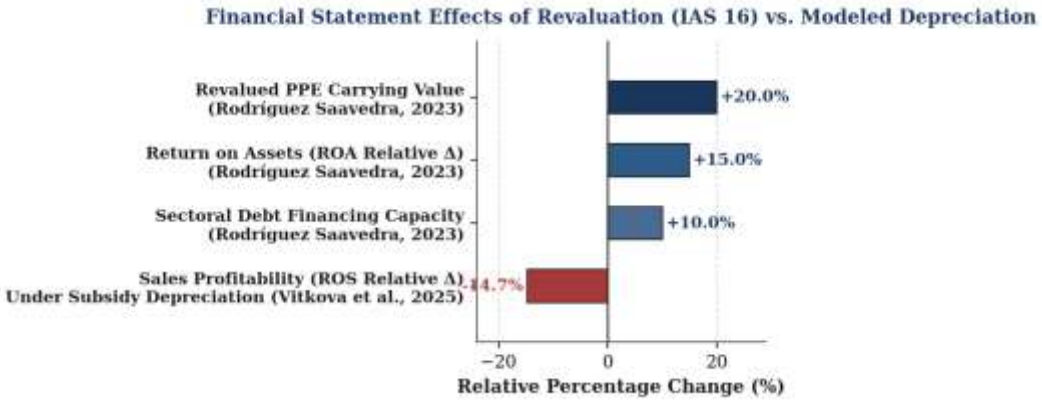


**Figure 2.** Empirical Financial Statement Impacts of IAS 16 Fixed Asset Revaluation and Subsidy-Adjusted Depreciation

(Source: *Rodríguez Saavedra, 2023, AG Management, 1, 11; Vitkova et al., 2025, Water, 17(3), 393*)

Additional institutional nuances emerge when governments use fiscal incentives to encourage fixed asset revaluation during macroeconomic recovery episodes. Analyzing Indonesian listed firms in the context of government policies that temporarily reduced final income tax rates on fixed asset revaluation

during pandemic recovery, Darmawan et al. (2022) evaluated the relationship between revaluation elections and market perceptions of future firm performance. Their findings indicate that while tax-incentivized revaluation policies help firms strengthen book equity and debt-to-equity ratios in the short run, capital market participants scrutinize whether the upward asset restatement is accompanied by genuine cash flow generation, as higher post-revaluation depreciable bases inevitably increase subsequent annual depreciation charges. Complementing this perspective, Kuzyk et al. (2025) examined national accounting practices for the revaluation and impairment of fixed assets under IFRS in Ukraine's agricultural sector, demonstrating that manual valuation procedures and inconsistent fair-value appraisals undermine financial statement comparability. Kuzyk et al. (2025) showed that integrating automated enterprise resource planning (ERP) valuation modules with continuous professional accountant training is essential to align national revaluation and impairment practices with IAS 16 and IAS 36 requirements.

**Asset Tangibility, Collateral Channels, and Corporate Capital Structure Decisions**

Beyond financial reporting valuation, the proportion of tangible fixed assets in a firm's total asset base, defined as asset tangibility or asset structure, occupies a central position in modern capital structure theory. Under Trade-Off Theory, firms balance the tax shield benefits of debt against expected bankruptcy and agency costs; because land, buildings, production plants, and standardized machinery retain physical collateral value in liquidation, high asset tangibility mitigates lender information asymmetry and reduces expected distress losses, thereby enabling higher financial leverage (Priyan et al., 2023; Abdel Zaher, 2026). Conversely, Pecking Order Theory posits that profitable and liquid firms prefer internal retained earnings over external debt to avoid adverse selection and flotation costs, implying a negative association between profitability/liquidity and leverage (Abdel Zaher, 2026; Fauziyanti et al., 2026).

Recent dynamic panel econometrics from emerging markets provide nuanced evidence on how asset structure interacts with debt maturity to drive corporate financial performance. Applying the Generalized Method of Moments (GMM) estimator to control for endogeneity and reverse causality across listed firms in East African capital markets, Priyan et al. (2023) demonstrated that both capital structure decisions and tangible asset structure strongly govern corporate returns. Specifically, Priyan et al. (2023) found that simultaneous increases in tangible fixed assets, short-term debt, and long-term debt positively and significantly increase Return on Total Assets (ROA). However, when evaluating Return on Equity (ROE), a critical maturity divergence emerged: while an increase in the total debt ratio raises ROE, an increase in long-term debt significantly *lowers* ROE, indicating that expensive long-term debt service and restrictive covenants in developing capital markets can erode residual shareholder returns even when backed by tangible fixed assets.

The collateral function of tangible fixed assets becomes particularly pronounced during exogenous macroeconomic and liquidity crises. Investigating 147 non-financial companies (1,623 firm-year observations across 14 sectors) listed on the Egyptian Stock Exchange (EGX) using Panel GMM, Arellano–Bond serial correlation tests, and Johansen cointegration analysis, Abdel Zaher (2026) examined capital structure resilience during the COVID-19 pandemic. The empirical results confirm that corporate leverage exhibits strong temporal persistence and is positively and significantly determined by firm size, asset tangibility (TANG), and growth opportunities, while remaining negatively associated with ROA, earnings

per share (EPS), operating cash flow, and liquidity. During the pandemic liquidity shock, lenders became markedly more selective and demanded higher collateral coverage; firms possessing substantial tangible fixed assets were able to secure crisis borrowing to sustain operations, resulting in a statistically significant positive crisis effect on leverage and a strong negative correlation between asset tangibility and cash liquidity holdings (Abdel Zaher, 2026).

Nevertheless, recent post-2023 evidence cautions that asset tangibility does not automatically translate into higher debt usage when interest rate volatility is elevated and unobserved firm-specific fixed effects are controlled. Analyzing Indonesian food and beverage manufacturing companies listed on the Indonesia Stock Exchange (IDX) using a Fixed Effect Model (FEM), Fauziyanti et al. (2026) found that although asset structure (the ratio of fixed assets to total assets) exhibited a positive regression coefficient of 0.3541 with capital structure, the effect was statistically insignificant ($p = 0.6055 > 0.05$). In high-interest-rate environments characterized by shifting post-pandemic consumption patterns, financial managers in profitable consumer sectors adopt conservative debt policies and rely on internal cash flows in accordance with Pecking Order Theory, even when they possess substantial production facilities, warehouses, and machinery that could serve as collateral (Fauziyanti et al., 2026).

**Operational Efficiency, Depreciation Regimes, Digital Reporting (XBRL), and Firm Profitability**

From an operational management perspective, owning tangible fixed assets generates corporate value only insofar as physical capital is efficiently utilized to generate revenue and maintained across its physical and economic life cycle. Empirical studies published between 2022 and 2026 consistently identify Fixed Asset Turnover (FAT), measured as net sales divided by net tangible fixed assets, and life-cycle asset management as primary drivers of corporate profitability and financial distress avoidance (Utami & Muslih, 2022; Vilarinho et al., 2023; Vilarinho et al., 2024). In a multi-year investigation of seasoned public companies listed on the Warsaw Stock Exchange (2014–2023), higher asset turnover and profit margins were shown to significantly reduce the probability of corporate financial distress (Sundkvist & Stenheim, 2022). Similarly, empirical analyses of Indonesian food, beverage, and industrial enterprises confirm that Fixed Asset Turnover exerts a positive effect on Return on Assets (ROA), while field-based life-cycle asset management, incorporating preventive maintenance, fuel and energy cost optimization, and timely equipment renewal, accompanied an increase in corporate ROA from 0.50 in 2023 to 0.72 in 2025 (Masterpiece Journal, 2026; Journal of Business, Social and Technology, 2026).

A major methodological breakthrough in the recent literature concerns the accounting and economic treatment of depreciation for infrastructure fixed assets financed through public subsidies. In capital-intensive utility sectors, such as water supply and sewerage networks, where tangible fixed assets represent 99.30% (median) of total fixed assets and up to 99.94% at the maximum, accounting depreciation normally serves two vital economic functions: it reduces taxable income as an operating cost and simultaneously accumulates internal financial resources (embedded in regulated utility tariffs) required for the future physical renewal of aging pipelines and treatment plants (Vitkova et al., 2025; Heumer et al., 2024; Parvaresh et al., 2022). However, under statutory accounting and tax legislation in jurisdictions such as the Czech Republic (Act No. 563/1991 Coll. and Act No. 586/1992 Coll.), tangible fixed assets acquired

through public subsidies cannot be depreciated for tax or tariff-recovery purposes, creating a severe long-term reinvestment financing gap (Vitkova et al., 2025).

To quantify and resolve this hidden economic distortion, Vitkova et al. (2025) analyzed 840 financial statements (420 balance sheets and 420 profit-and-loss accounts) and 420 annual reports across the 25 largest water management companies in the Czech Republic (controlling nearly 50% of national water infrastructure assets, valued at EUR 62.855 million / CZK 1,539,940 thousand). Their empirical audit revealed that public subsidies finance up to 20.03% of tangible fixed assets in leading regional utilities (and 19% on average in their primary longitudinal case study), while the median annual accounting depreciation rate of tangible fixed assets stands at 3.17% (ranging from 2.28% to 7.58%, and 3.50% in the 17-year longitudinal case study). When Vitkova et al. (2025) incorporated 'predicted' (modeled) straight-line depreciation on subsidy-financed fixed assets into corporate income statements to reflect true physical wear-and-tear reinvestment needs, median Return on Sales (ROS) declined from 6.53% to 5.57%, an absolute drop of 0.96 percentage points, representing a 14.7% (nearly 15%) relative reduction in sales profitability, with minimum ROS falling from +1.34% into an economic loss of -3.02%. Furthermore, dynamic sensitivity modeling (Variants 0, I, II, and III) demonstrated that under a 3.5% annual profit growth assumption, a utility that ceases subsidy-financed acquisitions (Variant I) remedies its cumulative economic depreciation deficit by 2024 (reaching EUR +313 thousand), whereas continuing 100% subsidy-rate acquisitions (Variant II) delays cumulative break-even until 2064, and moderating subsidy intensity to 50% (Variant III) achieves break-even in 2039 (Vitkova et al., 2025).

Alongside regular depreciation, the integrity of fixed asset carrying values depends critically on conditional conservatism through timely asset impairment testing (IAS 36). Because impairment write-downs immediately depress reported earnings, agency theory and socioemotional wealth (SEW) theory predict that corporate insiders often exercise opportunistic discretion to delay or underreport fixed asset impairments. Analyzing a large archival registry of Norwegian private companies, Sundkvist and Stenheim (2022) documented that private family firms are significantly more reluctant to recognize fixed asset impairment losses than non-family firms, reporting impairment losses in only 1% of firm-years (averaging 0.05% of lagged total assets) compared to 2% of firm-years (0.08% of lagged total assets) in non-family firms, though independent board representation and higher audit effort (measured via audit fees) significantly mitigate this reluctance. Building directly on these governance insights, Dalci (2025) examined 55,385 firm-year observations across two IFRS jurisdictions, 1,288 listed UK firms (24,472 observations) under mandatory XBRL adoption and 1,627 listed Australian firms (30,913 observations) under voluntary XBRL adoption. Using logistic regression and difference-in-differences specifications, Dalci (2025) established that both mandatory and voluntary XBRL adoption significantly increase the likelihood of reporting fixed asset impairments by enhancing machine-readable transparency and curbing managerial discretion, and that audit effort (natural logarithm of audit fees) positively moderates and amplifies this governance effect.

### Fixed Asset Intensity, Non-Debt Tax Shields, and Corporate Tax Management

The fifth thematic cluster in recent scholarship examines how Fixed Asset Intensity (FAI), also termed capital intensity and measured as the ratio of total fixed assets to total assets, interacts with corporate tax

planning, Effective Tax Rates (ETR), and regulatory enforcement. From a fiscal standpoint, depreciable fixed assets generate non-debt tax shields: statutory depreciation charges reduce pre-tax accounting and taxable income without requiring an immediate cash outflow, while differences between financial accounting depreciation lives and accelerated tax depreciation schedules create book-tax differences (Prihatini & Amin, 2022; Arditra et al., 2025). However, empirical studies conducted between 2022 and 2026 demonstrate that the impact of fixed asset intensity on tax avoidance is highly sensitive to sectoral tax regimes and asset composition.

In manufacturing and consumer goods sectors, empirical evidence largely supports the tax-shield hypothesis that higher capital intensity facilitates corporate tax optimization. Analyzing 27 consumer non-cyclicals companies (135 firm-year observations from a population of 126 firms) listed on the Indonesia Stock Exchange (IDX) using multiple linear regression, Arditra et al. (2025) found that Fixed Asset Intensity and transfer pricing significantly influence corporate tax avoidance, whereas thin capitalization exhibits no statistically significant effect. Similarly, empirical research on listed multinational manufacturing companies in Nigeria and Indonesia confirms that capital intensity significantly affects both Effective Tax Rates and book-tax differences, prompting scholars to recommend that corporate Chief Financial Officers (CFOs) and board audit committees integrate long-term tax depreciation modeling directly into capital budgeting evaluations (Open Journals IJAAR, 2025; JICP, 2025).

Conversely, in heavily regulated infrastructure and extractive mining sectors, recent empirical studies uncover contrasting relationships between fixed asset intensity and Effective Tax Rates. Investigating 112 outlier-adjusted firm-year observations (from a population of 68 companies) in the Indonesian listed infrastructure sector during 2020–2024 using Moderated Regression Analysis (MRA), Pujiastuti and Muti'ah (2026) found that while capital structure and transfer pricing had no effect on tax avoidance, Fixed Asset Intensity exerted a statistically significant *positive* effect on ETR—meaning that higher fixed asset intensity *reduced* corporate tax avoidance, and firm size did not moderate this relationship. In long-lived infrastructure firms, a large fraction of fixed assets consists of already fully depreciated network assets, non-depreciable land rights, or construction-in-progress that does not yet generate tax-deductible depreciation, while strict regulatory oversight limits aggressive tax sheltering. In a parallel MRA study of 28 IDX-listed mining companies (112 observations across 2021–2024) using EViews 13, Loanza (2026) found that Fixed Asset Intensity had no significant direct effect on tax management and was not moderated by profitability, whereas financial leverage significantly influenced tax management and was strengthened by profitability.

Fixed asset intensity also plays a pivotal role in the political economy of environmental and leasing regulation. Because physical fixed assets are immobile and create high sunk costs (low exit mobility), one might expect capital-intensive industrial plants to be more vulnerable to state regulatory penalties; yet Cao et al. (2022) demonstrated in *Regulation & Governance* that high fixed asset intensity alters local environmental enforcement dynamics in China, as local authorities weigh environmental fines against the macroeconomic employment and tax base anchored by large fixed-asset enterprises. At the same time, enterprises seeking to modernize their fixed asset base while preserving balance-sheet flexibility and meeting environmental management standards increasingly utilize green equipment leasing as a strategic alternative to outright debt-financed acquisition (Bocok et al., 2023). Table 3 synthesizes the empirical

designs, sample structures, and quantitative findings across the core peer-reviewed studies examined in this narrative review.

**Table 3. Empirical Synthesis of Recent Peer-Reviewed Studies on Fixed Assets (2022–2026)**

| Author(s) & Year | Sample & Empirical Context | Methodology / Estimator | Key Empirical Findings on Fixed Assets |
|---|---|---|---|
| Atabayeva et al. (2024) | 7 economies (China, USA, Germany, Ireland, Japan, Canada, Kazakhstan), 1997–2022 | Non-linear OLS optimization (SPSS & Python) | GFCF explains 64.8% of labor productivity growth variance in China (optimal threshold: 37.4% GDP; Ireland: 21.5%; Germany: 20.67%; Kazakhstan: 23.5%). |
| Kalusová & Badura (2022) | 250 Slovak enterprises across 6 economic sectors | Multi-factor panel regression analysis | Capital allocation into fixed assets is jointly governed by macro cycles (GDP, inflation, interest/tax rates) and internal non-debt tax shields and risk. |
| Hussain et al. (2022) | Listed sugar manufacturing firms in Pakistan | OLS, FE, RE, PCSE & Dynamic System GMM | IAS 16 fixed asset revaluation surplus (mean 13.45) negatively impacts future operating income and operating cash flows; high debt (0.584) drives revaluation. |
| Darmawan et al. (2022) | Indonesian listed firms under revaluation tax cut policy | Panel regression & policy evaluation | Evaluated relationship between fixed asset revaluation and future performance perception during pandemic tax-incentive recovery programs. |
| Rodríguez Saavedra (2023) | 180 companies in Arequipa, Peru applying IAS 16 | Spearman's Rho & pre/post comparative analysis | IAS 16 revaluation increased asset carrying value by 20% ($300k–$600k), raised ROA by 15% (+2% pts), and expanded operating cash flow by $150k–$300k. |
| Kuzyk et al. (2025) | Agricultural enterprises in Ukraine under IFRS/IAS 16 | Institutional & comparative accounting analysis | Automated ERP valuation systems and continuous IFRS training reduce revaluation subjectivity and enhance financial statement transparency. |
| Priyan et al. (2023) | Listed firms across East African capital markets | Dynamic Panel Generalized Method of Moments (GMM) | Higher tangible fixed assets, short-term debt, and long-term debt increase ROA; total debt raises ROE, whereas long-term debt reduces ROE. |
| Abdel Zaher (2026) | 147 non-financial firms (1,623 obs., 14 sectors) on Egyptian Stock Exchange | Panel GMM, Arellano–Bond & Johansen cointegration | Asset tangibility (TANG) positively drives leverage and crisis borrowing capacity during COVID-19; profitability and liquidity negatively affect leverage. |

| Author(s) & Year | Sample & Empirical Context | Methodology / Estimator | Key Empirical Findings on Fixed Assets |
|---|---|---|---|
| Fauziyanti et al. (2026) | Indonesian IDX food & beverage companies (2021–2023) | Panel Fixed Effect Model (FEM) | Asset structure shows a positive but statistically insignificant effect on capital structure ($\beta = 0.3541$, $p = 0.6055$) under high interest rate volatility. |
| Vitkova et al. (2025) | 25 largest Czech water infrastructure companies (840 financial statements) | Vertical/ratio analysis & multi-variant sensitivity modeling | Tangible fixed assets equal 99.3% of fixed assets (up to 20.03% subsidy-financed); including modeled subsidy depreciation lowers median ROS by 14.7% (6.53% to 5.57%). |
| Sundkvist & Stenheim (2022) | Norwegian private family vs. non-family firms | Archival logistic & Tobit regression | Family firms report fewer fixed asset impairments (1% vs. 2% of firm-years; 0.05% vs. 0.08% of assets); independent boards and audit fees mitigate reluctance. |
| Dalci (2025) | 1,288 UK firms (24,472 obs.) & 1,627 Australian firms (30,913 obs.) | Logistic regression & Difference-in-Differences | Mandatory and voluntary XBRL adoption significantly increases fixed asset impairment recognition; audit effort (audit fees) positively moderates this effect. |
| Arditra et al. (2025) | 27 IDX consumer non-cyclicals firms (135 obs., 2019–2023) | Multiple linear regression (SPSS 25) | Fixed Asset Intensity and transfer pricing significantly affect corporate tax avoidance, whereas thin capitalization has no direct impact. |
| Pujiastuti & Muti'ah (2026) | 68 IDX infrastructure firms (112 final obs., 2020–2024) | Multiple regression & Moderated Regression Analysis (MRA) | Fixed Asset Intensity positively affects ETR (significantly reducing corporate tax avoidance); firm size does not moderate the relationship. |
| Loanza (2026) | 28 IDX mining companies (112 obs., 2021–2024) | Moderated Regression Analysis (EViews 13) | Fixed Asset Intensity has no significant effect on tax management in extractive mining; leverage negatively affects tax management, moderated by profitability. |

(Source: Author's synthesis of peer-reviewed journal articles, 2022–2026)

## Integrated Economic Synthesis, Methodological Critique, and Policy Implications

Synthesizing the empirical evidence across all five thematic clusters reveals three overarching theoretical and methodological insights that advance the study of fixed assets. First, the reviewed literature demonstrates a profound interdependence between accounting measurement choices and real economic resource allocation. When firms revalue fixed assets upward under IAS 16 (Rodríguez Saavedra, 2023) or omit economic depreciation on subsidy-financed infrastructure (Vitkova et al., 2025), the resulting financial statements alter reported Return on Assets, Return on Sales, and debt-to-equity ratios. However, if these accounting adjustments are uncoupled from physical productivity and cash-flow generation, as observed in

highly indebted emerging-market firms facing currency depreciation (Hussain et al., 2022) or municipal utilities facing long-term pipeline replacement deficits (Vitkova et al., 2025), capital misallocation ensues. Effective fixed asset governance therefore requires integrating engineering life-cycle asset management models (Vilarinho et al., 2023; Vilarinho et al., 2024) directly into financial reporting and capital budgeting frameworks.

Second, from an econometric standpoint, the 2022–2026 literature highlights why static ordinary least squares regressions frequently yield conflicting results regarding the effects of asset structure on leverage, profitability, and tax avoidance. Because corporate investment in tangible fixed assets is simultaneously determined alongside debt issuance, dividend policy, and tax planning, dynamic panel estimators, specifically System GMM (Hussain et al., 2022; Priyan et al., 2023; Abdel Zaher, 2026) and Fixed Effect or Difference-in-Differences designs (Dalci, 2025; Fauziyanti et al., 2026), are indispensable for isolating causal mechanisms from unobserved firm heterogeneity. Third, the emergence of digital financial reporting infrastructures such as XBRL (Dalci, 2025) and automated ERP asset valuation systems (Kuzyk et al., 2025) demonstrates that technological standardization significantly strengthens external audit verification and reduces opportunistic manipulation of fixed asset impairments and revaluations.

## CONCLUSION

This narrative review has synthesized peer-reviewed economic and accounting scholarship from the 2022–2026 period to establish an integrated understanding of how tangible fixed assets shape macroeconomic growth, financial reporting quality, corporate capital structure, operational efficiency, and fiscal governance. The overarching conclusion emerging from the synthesis is that the economic value of fixed assets is governed by structural threshold effects and institutional complementarities rather than simple linear accumulation. At the macroeconomic level, gross fixed capital formation serves as a potent engine of labor productivity up to economy-specific saturation thresholds (ranging from 20.67%–21.50% of GDP in advanced European economies to 37.40% of GDP in industrializing economies), beyond which capital deepening suffers diminishing returns unless paired with R&D innovation and directed away from speculative real estate toward productive machinery.

At the corporate and institutional level, the accounting and financial mechanisms attached to fixed assets exhibit pronounced context dependency. While fair value revaluation under IAS 16 enhances equity solvency, borrowing capacity, and return ratios in stable regulatory settings, it remains susceptible to opportunistic debt-covenant manipulation during periods of currency depreciation and financial distress, necessitating strict audit oversight and digital XBRL reporting to enforce conditional conservatism and timely impairment recognition. Simultaneously, while asset tangibility provides critical collateral that sustains credit access during exogenous shocks, long-term value creation ultimately depends on active life-cycle asset management, realistic depreciation modeling that accounts for subsidy-financed infrastructure replacement, and transparent alignment between capital budgeting and corporate tax governance. Future empirical research should employ cross-national panel designs to investigate how climate transition risks, green fixed asset leasing, and artificial-intelligence-driven predictive maintenance reshape the economic useful lives and valuation of tangible fixed assets.

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