Analysis of the Impact of Product Profitability Index Based on Economic Complexity on the Relationship Between Financial Leverage, Asset Efficiency, and Firm Scale with Accounting Profit

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Abstract: The present study aims to introduce a novel approach to measuring the product profitability index based on economic complexity and to analyze its relationship with accounting profit, which is recognized as one of the most critical performance evaluation metrics and a determinant of the value of economic enterprises. This research adopts a mixed-methods approach, and data have been collected through two different methods. To analyze the research variables and relationships, field data were gathered from sources such as the Economic Complexity Atlas website and the Harmonized System (HS) product classification, along with the financial statements of selected companies. Additionally, relevant theories and concepts were extracted using a library-based method. The documentary method was employed for data collection. The study was designed as a survey and aims to provide both descriptive and predictive insights. The sample comprises 286 companies from the Fortune 500 list during the period from 2014 to 2018, classified across 66 product codes (HS) and selected using panel and pooled data. The results of the model indicate that the newly introduced approach for identifying the profitability of high-complexity products has a significant relationship with accounting profit. Furthermore, the findings reveal that variables such as firm size, financial leverage, and return on assets have a meaningful relationship with accounting profit through the effect of the product profitability index based on the proposed model. To enhance corporate profitability and forecast the most profitable products for professional investors (who are among the primary users of financial information), it is essential to consider product complexity analysis and its effect on profitability, as it can be instrumental in selecting effective production and service delivery strategies. According to the findings, companies with higher operating profits generally produce more complex and profitable products. Therefore, shareholders and corporate managers should prioritize the selection of complex products with lower ubiquity, as these products typically exhibit higher profitability.

Keywords: Operating profit, product profitability index, economic complexity, financial leverage, asset efficiency, firm scale.

1. Introduction

Economic complexity reflects the knowledge intensity and technological sophistication embedded in a country or firm's export structure, suggesting that firms engaged in the production of complex products are more likely to achieve sustainable profitability and competitive advantage in dynamic markets [1, 2]. Traditional profitability assessments, relying solely on financial ratios and cost-based analysis, often overlook the strategic weight of product differentiation rooted in complexity. The foundational work by Hidalgo and Hausmann (2011) posits that the complexity of products not only shapes export dynamics at the national level but also influences firm-level outcomes in innovation-intensive sectors [1].

The relevance of economic complexity to firm profitability has been increasingly substantiated in empirical studies. Jelvezan et al. (2025), for instance, present compelling evidence linking product complexity with higher profit margins among export-oriented firms in emerging markets. Their findings affirm that firms producing more complex products outperform their counterparts in less sophisticated product categories in terms of both operational and net profitability [3]. These findings resonate with earlier conclusions by Brown (2020), who demonstrated that product complexity is positively associated with gross margin and return on invested capital in the manufacturing sector [4]. Similarly, Johnson (2023) highlights that navigating economic complexity through innovation and adaptability enables firms to craft more resilient and profitable global strategies [5].

From a strategic management perspective, understanding profitability through the lens of product complexity offers an extension to the classical resource-based view. Barney (2021) emphasizes that sustainable competitive advantage stems from the unique, valuable, and inimitable capabilities that firms deploy in complex environments [6]. When complexity itself becomes a differentiator—especially in high-tech and advanced manufacturing sectors—it reinforces a firm's position in the market. Choi et al. (2022) further elaborate on this by asserting that supply chain complexity, when managed effectively, contributes to improved performance outcomes, thus underscoring the intertwined nature of operational complexity and financial gains [7].

Despite the strategic significance of complexity, the translation of this concept into quantifiable indices usable in financial analysis has remained underexplored. Tools such as the Product Complexity Index (PCI) and the Company Profitability Index (CPI), developed in line with economic complexity theory, provide a quantifiable bridge linking macro-level complexity to micro-level firm profitability. These indices encapsulate not only the knowledge embedded in a firm's product portfolio but also the interdependencies across sectors and geographies that determine value creation [8].

The interrelation between firm profitability and other financial indicators—specifically, firm size, financial leverage, and return on assets (ROA)—has long been established in financial literature. Chen and Zhang (2018) argue that profitability is a primary driver of firm growth, particularly when firms reinvest retained earnings to expand asset bases or enter new markets [9]. Similarly, DeAngelo and Stulz (2015) highlight that corporate financial policy, especially debt structuring, exerts a substantial influence on profitability outcomes through both cost of capital and risk channels [10]. Their findings are echoed by Tin and Hasman (2020), who emphasize that excessive leverage may undermine profitability, particularly in volatile industries or under tight credit conditions [11].

Return on assets (ROA) also serves as a vital proxy for operational efficiency. Firms that deploy their assets more effectively are likely to generate superior profit margins. Martin and Rogers (2020) posit that ROA not only reflects the internal efficiency of firms but also signals strategic alignment with market demands [12]. In this context, firm size plays a dual role—while larger firms may benefit from economies of scale, they often face diminishing returns in agility and responsiveness. Kotler and Keller (2022) maintain that the ability to scale operations without compromising innovation is a key determinant of sustained profitability [13].

Building on this foundation, our study explores how these traditional financial variables interact with the more nuanced concept of product profitability based on economic complexity. Wagner (2011) highlights that complexity in supply networks introduces both risk and opportunity, depending on how well firms manage interdependencies [14]. Jiang (2019) extends this argument by focusing on startup ecosystems, showing that firms engaged in complex technological production achieve higher profitability despite higher initial costs and learning curves [15]. The implication is that complexity, though resource-intensive, can yield superior returns when strategically harnessed.

In alignment with Porter's (2020) competitive strategy framework, product complexity can also serve as a basis for differentiation and cost leadership. Porter emphasizes that firms must make clear strategic choices—either to differentiate through value-added offerings or to compete on cost [16]. Complexity, when converted into technological or functional superiority, offers a pathway to unique market positioning. This aligns with Simon et al. (2017), who argue that complexity-based differentiation in IT and industrial products creates barriers to imitation and enhances customer loyalty [17].

To ground this conceptual framework in empirical analysis, the current study examines 286 profitable firms from the Fortune Global 500 list over the period 2014 to 2018. Firms were analyzed across 66 Harmonized System (HS) product categories using panel data methods to assess how product-level complexity—measured through a modified Company Profitability Index—affects accounting profit. The CPI integrates firm-level data on operating profit, leverage, asset efficiency, and product composition, allowing for a granular analysis of how complexity enhances or undermines profitability [3].

This research also draws from recent advancements in financial statement analysis. Penman (2013) and Robinson et al. (2022) advocate for the integration of operational, investment, and financing dimensions into a comprehensive profitability analysis framework [18, 19]. By combining these dimensions with complexity-based metrics, this study contributes to a more holistic understanding of what drives profitability in global firms. Furthermore, it acknowledges the dynamic interplay between structural factors (e.g., firm scale, capital structure) and strategic inputs (e.g., product design, supply chain complexity), as highlighted by Williamson (2019) in his institutional economics framework [20].

The study also accounts for the multi-criteria nature of decision-making in competitive environments. As Doulattpour et al. (2020) point out, evaluating product profitability in the context of economic complexity requires an integrative approach that incorporates both qualitative and quantitative indicators [2]. These include not only firm-specific data but also macroeconomic signals embedded in product ubiquity and knowledge intensity. The growing complexity of global value chains further compounds this analysis, as shown by Dumond et al. (2021), who link complexity to differential profit outcomes across industries [8].

Finally, the broader implications of this research extend to strategic management, marketing, and policy-making. In global markets characterized by rapid technological shifts and volatility, managers must understand the trade-offs and synergies between complexity and profitability. Kotler and Keller (2022) argue that aligning product strategy with organizational capabilities is key to market success [13]. Meanwhile, Javeed et al. (2020) demonstrate that external regulatory and competitive pressures moderate the impact of strategic decisions on firm outcomes, further reinforcing the need for adaptive and complexity-aware models of profitability [21].

Thus, this study aims to bridge the gap between economic complexity theory and traditional financial analysis by empirically evaluating how product-level complexity influences accounting profit.

2. Methodology

The present study was conducted with the aim of introducing a novel approach for calculating the product profitability index using economic complexity and examining its relationship with accounting profit. The research is of a mixed-methods type, and data collection was performed through *field methods* (for company-related information) and *library research* (for theories and conceptual frameworks). Data were gathered through a *documentary method* from various sources.

The objective of the study is *descriptive*, and the statistical population includes the top 500 profitable global companies in 2018, extracted from the Fortune website. Out of these 500 companies, after applying specific criteria (such as aligned fiscal year-end, data availability, and exclusion of loss-making firms), 214 companies were eliminated, and finally, 286 companies were selected across 66 product categories (HS codes).

The required financial information was collected from the companies' official websites. To apply the economic complexity approach, the products under review were converted into Harmonized System (HS) codes, and the product complexity index was retrieved from the Economic Complexity Atlas by Harvard University. Data analysis was performed using E-Views 12 software.

Research Models and Variable Measurement

Research Variables

Accounting Profit (Dependent Variable): Accounting profit is calculated as the difference between a company's revenues and operating expenses. This variable is typically measured using net profit or operating profit. Net profit reflects the difference between total revenues and total expenses after taxes and other charges are deducted, while operating profit refers only to revenues and expenses related to the company's core operations. Accounting profit is one of the fundamental indicators used for assessing a company's financial performance [18].

Product Profitability Index Derived from the Economic Complexity Model (Moderating Variable):

To examine the relationship between economic complexity and product profitability, an estimator is introduced to determine the profitability level generated by the production of a specific product. This is referred to as the **Company Product Profitability Index (CPI)**.

To evaluate product-level profitability, the **Product Profitability Index** is considered as the average profitability level of a manufactured product, weighted based on the importance of each product in a company's production portfolio. Formally, the CPI for product *p* is expressed as:

Equation (1):

$$CPI\_p = \sum\_c (M\_cp \times Size\_c \times Op\_Profit\_c)$$

Equation (2):

$$CPI\_p = (1 / N\_p) \times \sum\_c (M\_cp \times S\_cp \times Op\_Profit\_c)$$

Equation (3):

$$CPI\_p = (1 / N\_p) \times \sum\_c (M\_cp \times S\_cp \times (Op\_Profit\_c / Size\_c))$$

Equation (4):

$$CPI\_p = (1 / N\_p) \times \sum\_c (M\_cp \times S\_cp \times Size\_c \times Op\_Profit\_c)$$

Equation (5):

$$CPI\_p = (1 / N\_p) \times \sum\_c (M\_cp \times S\_cp \times Fin\_Leverage\_c \times (Op\_Profit\_c / Size\_c))$$

Here, *Op_Profit_c* is the profitability coefficient of company *c*. *M_cp* forms the product-company matrix in the above equations. If *M_cp* equals 1, then company *c* produces product *p* with revealed competitive advantage; otherwise, it equals 0. *S_cp* represents the production share of company *c* for product *p*. *N_p* is a normalization factor to ensure that the product profitability indices are weighted averages of profitability coefficients.

S_cp and *N_p* are calculated as follows:

Equation (6):

S_cp = X_cp / (∑_p' x_cp')

N_p = ∑_c (M_cp × S_cp)

S_cp is the ratio of *X_cp*, which refers to the total net profit from producing product *p* by company *c* (among the sample companies), to the total share of product *p'* net profit produced by company *c* (among companies producing similar product *p'*), computable from ∑_p' x_cp' [3].

Debt-to-Asset Ratio (Financial Leverage, Independent Variable):

The debt-to-asset ratio is calculated by dividing total liabilities by total assets. This ratio indicates the extent to which debt is used as a financing source relative to a company's total assets. Investors use this ratio to analyze the firm's financial position and predict potential risks [10].

F.L = Total Debt / Total Assets

Return on Assets (ROA, Independent Variable):

Return on assets indicates a company's efficiency in using its assets to generate profit. It is calculated by dividing net income by total assets. ROA is commonly used as a key metric for evaluating corporate financial performance [9].

ROA = Net Profit / Total Assets

Firm Size (Independent Variable):

In this study, firm size is measured using the natural logarithm of company sales. The logarithmic transformation is used due to the unequal distribution of firm sizes, which helps normalize the data for statistical analysis. This method reduces the influence of outliers and enhances analytical accuracy.

SIZE_(j,t) = log(Net Sales_(j,t))

3. Findings and Results

After the collection and registration of the data, it is necessary to summarize and categorize them using specific methods. Descriptive statistics are considered a method for summarizing and describing the characteristics of a data set. In this study, information related to various indices affecting company profitability and financial performance—namely, operating profit, financial leverage, firm size, return on assets, and the product profitability index based on economic complexity (calculated using five different methods)—was collected. The table below presents the descriptive statistics for the research variables.

Table 1. Descriptive Statistics of Research Variables

Index	Operating Profit	Financial Leverage	Firm Size	Return on Assets	CPI1	CPI2	CPI3	CPI4	CPI5
Mean	6637.319	0.296893	4.027614	461.7527	49910272	1101791.602	206066.8732	2012119.403	14264.46932
Median	6637.320	0.3	4.03	459.81	49533391	1091548.6	204086.67	1995887.9	14218.53
Maximum	37571.48	1.28	8.39	15971.49	327671981.1	7810379.28	1450490.43	13876325.84	111821.83
Minimum	-0.2429683	-0.46	-0.33	-12480.35	-302816.4	-4995301	-812889.8	-13055944	-74396.53
Std. Deviation	9642.705	0.305562	1.359263	4829.152	113999544.1	1979975.496	367051.6394	4869397.801	28790.6592
Skewness	0.00035315	0.022495	0.000127	0.010613	-0.019171	0.025305291	0.031219899	-0.018640	0.023638587
Kurtosis	2.921841	2.856723	2.921980	2.888038	2.848526	2.977627554	2.958810246	2.847853678	2.975234456
Observations	1430	1430	1430	1430	1430	1430	1430	1430	1430

The results show that various variables such as operating profit, financial leverage, and firm size exhibit high fluctuations. As observed in Table 1, the information pertains to various indices that influence company profitability and financial performance. These indices include operating profit, financial leverage, firm size, return on assets, and the product profitability index based on economic complexity, calculated using five different methods. Overall, the data indicate that the variables exhibit high variability, with significant differences between maximum and minimum values. Some variables (such as operating profit and return on assets) display considerable fluctuations, indicating substantial differences in financial performance among the companies in the sample. The high standard deviation for some variables reflects volatility and diversity in values. Both skewness and kurtosis are generally positive, suggesting that most data points are concentrated on the lower end, with a few extreme high values.

To assess data stability, various unit root tests such as the Levin, Lin & Chu (LLC) test, the Augmented Dickey-Fuller (ADF) test, and the Im, Pesaran & Shin (IPS) test were applied. The test results indicate that all research variables are statistically stationary at the 5% significance level, as the p-values for all variables were less than 0.05.

Table 2. Unit Root Test Results for Research Variables (All Observations)

Variable	Observations	IPS Test p-value	ADF Test p-value	LLC Test p-value	IPS Statistic	ADF Statistic	LLC Statistic
Operating Profit	1430	0.0000	0.0016	0.0000	845.578	676.570	-34.317
Financial Leverage	1430	0.0000	0.0000	0.0000	1573.28	1351.05	-2032.09
Firm Size	1430	0.0000	0.0010	0.0000	806.402	680.532	-102.438
Return on Assets	1430	0.0000	0.0000	0.0000	361.634	384.484	-39.7670
Product Profitability Index	1430	0.0000	0.0000	0.0000	426.093	388.922	-28.6691

To evaluate the normality of the data distribution, the Jarque–Bera test was used. The results show that all research variables follow a normal distribution, as the p-values of the test were greater than 0.05; therefore, the assumption of data normality is confirmed.

Table 3. Jarque–Bera Test Results for Research Variables (All Observations)

Index	Operating Profit	Financial Leverage	Firm Size	Return on Assets	CPI1	CPI2	CPI3	CPI4	CPI5
Mean	6637.319	0.296893	4.027614	461.7527	49910272	1101791.602	206066.8732	2012119.403	14264.46932
Jarque–Bera	0.363733	1.342808	0.362438	0.773215	1.454707	0.182442	0.333388	0.481410	0.918640
p-value	0.833713	0.510991	0.834253	0.679358	0.483186	0.912816	0.846459	0.481410	0.918640
Observations	1430	1430	1430	1430	1430	1430	1430	1430	1430

To select the appropriate model for panel data, the Lagrange Multiplier (LM) and Hausman tests were conducted. The results of both tests reject the null hypotheses in favor of the panel model with fixed effects over pooled OLS and random effects models. Therefore, the data were estimated using a panel model with fixed effects and the least squares dummy variable (LSDV) method.

Table 4. LM and Hausman Test Results for Choosing Between Pooling or Panel Model

Model	LM Test p-value	LM Test Result	Hausman Test p-value	Hausman Test Result
Hypothesis	0.0000	Panel	0.0000	Fixed Effects

Source: Research findings

Following the classical regression tests, all assumptions were examined and confirmed. The classical assumptions of the regression model, including: 1) zero mean of errors, 2) constant error variance (homoscedasticity), and 3) absence of autocorrelation in the error terms, were all met. Due to the limited space of this article, detailed results of these tests are not reported here. These results ensure that the regression model is properly fitted, and the research hypotheses are confirmed at the 99% confidence level.

Based on the specified statistical models, the cumulative correlation of operating profit with five different functional forms of the Product Profitability Index, along with firm size, financial leverage, and return on assets, was measured across all companies over a 5-year period. The corresponding results, computed using E-Views software, are presented in the following tables.

Table 5. Results of the First Cumulative Multiple Regression

Variable	Coefficient	t-Statistic	Standard Error	Significance Level
Financial Leverage	-1382.672	-2.295867	602.2439	**0.0219
Firm Size	935.6898	6.187502	151.2225	*0.0000
Return on Assets	1.159225	23.37691	0.049588	*0.0000
Product Profitability Index	2.3405	5.867059	3.9906	*0.0000
R-squared	0.9642	RSS	4.7209	
Adjusted R-squared	0.9552	Durbin-Watson	1.704	
Mean of Dependent Variable	6615.308	Std. Dev. of Dep. Var	9629.581	

*Significance at 1% level; **Significance at 5% level

These results indicate that all variables are statistically significant at the 5% level. Therefore, the hypothesis is accepted. In this regression, financial leverage shows a significant negative relationship, while firm size, return on assets, and product profitability index exhibit a significant positive relationship with operating profit. The Durbin-Watson statistic of 1.704 indicates the absence of autocorrelation. The R-squared value suggests that 96% of the variation in operating profit is explained by the independent variables.

Table 6. Results of the Second Cumulative Multiple Regression

Variable	Coefficient	t-Statistic	Standard Error	Significance Level
Financial Leverage	-1354.014	-2.229314	607.3680	**0.0260
Firm Size	1265.502	9.565187	132.3029	*0.0000
Return on Assets	1.174572	23.43720	0.050116	*0.0000
Product Profitability Index	8.00818	4.239524	0.000193	*0.0000
R-squared	0.9637	RSS	4.7909	
Adjusted R-squared	0.9545	Durbin-Watson	1.6935	
Mean of Dependent Variable	6615.308	Std. Dev. of Dep. Var	9629.581	

*Significance at 1% level; **Significance at 5% level

All variables are statistically significant at the 5% level, thus supporting the hypothesis. Financial leverage maintains a significant inverse relationship, while firm size, return on assets, and the product profitability index show significant direct relationships. The Durbin-Watson statistic (1.6935) supports the absence of autocorrelation. The R-squared value confirms that 96% of operating profit variance is explained by the model.

Table 7. Results of the Third Cumulative Multiple Regression

Variable	Coefficient	t-Statistic	Standard Error	Significance Level
Financial Leverage	-1359.667	-2.254221	603.1650	**0.0244
Firm Size	1450.440	11.52805	125.8183	*0.0000
Return on Assets	1.188097	23.78323	0.049955	*0.0000
Product Profitability Index	6.00675	5.632232	0.001185	*0.0000
R-squared	0.9642	RSS	4.7309	
Adjusted R-squared	0.9550	Durbin-Watson	1.697	
Mean of Dependent Variable	6615.308	Std. Dev. of Dep. Var	9629.581	

*Significance at 1% level; **Significance at 5% level

The significance levels of all variables remain below 0.05, confirming the hypothesis. Financial leverage again demonstrates a significant inverse relationship, whereas firm size, return on assets, and the product profitability index show significant positive relationships with operating profit. The Durbin-Watson statistic of 1.697 indicates no autocorrelation, and 96% of the variance in operating profit is explained by the model.

Table 8. Results of the Fourth Cumulative Multiple Regression

Variable	Coefficient	t-Statistic	Standard Error	Significance Level
Financial Leverage	-1466.818	-2.3996	611.2678	**0.0244
Firm Size	1369.236	10.28947	133.0715	*0.0000
Return on Assets	1.158960	23.04188	0.050298	*0.0000
Product Profitability Index	1.001120	1.5676	7.6805	*0.0000
R-squared	0.9632	RSS	4.850	
Adjusted R-squared	0.9539	Durbin-Watson	1.685	
Mean of Dependent Variable	6615.308	Std. Dev. of Dep. Var	9629.581	

*Significance at 1% level; **Significance at 5% level

All variables are statistically significant at the 5% level. The inverse relationship between financial leverage and operating profit is confirmed, while the other variables demonstrate positive significant effects. The Durbin-Watson statistic (1.685) confirms no autocorrelation, and the model explains 96% of the variation in operating profit.

Table 9. Results of the Fifth Cumulative Multiple Regression

Variable	Coefficient	t-Statistic	Standard Error	Significance Level
Financial Leverage	-2122.088	-3.429119	618.8435	**0.0006
Firm Size	1380.572	10.88984	126.7762	*0.0000
Return on Assets	1.17048	23.43027	0.049956	*0.0000
Product Profitability Index	5.001153	4.614672	0.011085	*0.0000
R-squared	0.9638	RSS	4.7709	
Adjusted R-squared	0.9546	Durbin-Watson	1.71	
Mean of Dependent Variable	6615.308	Std. Dev. of Dep. Var	9629.581	

*Significance at 1% level; **Significance at 5% level

These results confirm that all variables are significant at the 1% level. The inverse effect of financial leverage remains consistent, while firm size, return on assets, and product profitability index have significant positive impacts on operating profit. The Durbin-Watson statistic of 1.71 suggests no autocorrelation, and the model explains 96% of the variance in the dependent variable.

4. Discussion and Conclusion

The results of this study provide robust empirical support for the proposition that product profitability—measured through economic complexity—has a significant and positive relationship with firms' operating profit. Using five cumulative regression models across 286 globally profitable firms over a five-year period (2014–2018), we find that the Product Profitability Index (CPI), developed from the principles of economic complexity, serves as a meaningful predictor of accounting profit when considered alongside firm-level financial indicators such as size, leverage, and return on assets. In all five models, the CPI demonstrated a statistically significant positive effect on operating profit, reaffirming the central hypothesis of this study.

One of the most compelling findings is the consistent inverse relationship between financial leverage and operating profit. Across all models, leverage negatively impacted profitability, and the relationship was statistically significant. This outcome aligns with previous studies emphasizing the risk implications of debt-financing structures on firm performance. For example, DeAngelo and Stulz (2015) explain that firms with higher leverage are more exposed to financial fragility, particularly under market uncertainty or revenue instability, which may suppress profitability [10]. Tin and Hasman (2020) also found that the debt-to-asset ratio negatively correlates with profit metrics, particularly in manufacturing and capital-intensive industries, where financial obligations constrain investment flexibility [11].

Conversely, firm size positively correlates with operating profit in all models, highlighting the advantages of scale economies, resource depth, and operational maturity. Kotler and Keller (2022) argue that larger firms benefit from cost advantages, bargaining power, and broader market reach, which collectively enhance profitability potential [13]. This is consistent with findings by Magnusson (2015), who demonstrated that in complex industries such as automotive manufacturing, larger firms tend to integrate complexity management with profitability strategy more effectively [22]. The results of this study extend that logic by showing that size alone does not explain profitability—rather, size combined with the production of complex, high-value products enhances firm outcomes.

Another important variable, return on assets (ROA), was also positively and significantly associated with profitability across all regression models. This confirms that firms that efficiently utilize their assets are more likely to generate higher operating profits. ROA is often interpreted as a reflection of internal management efficiency, operational alignment, and capital utilization [9]. Martin and Rogers (2020) also suggest that ROA serves as a strategic metric, capturing both input-output dynamics and resource allocation decisions [12]. Within this study, the strong relationship between ROA and profitability implies that asset-heavy firms that strategically engage in the production of complex goods experience enhanced financial performance.

The most critical variable of interest—the Product Profitability Index derived from economic complexity—emerged as a consistently positive and statistically significant determinant of accounting profit. This confirms that firms engaged in the production of complex goods tend to achieve better profitability outcomes. Complexity, in this context, refers to the knowledge intensity, intersectoral linkages, and production capabilities embedded in the goods a firm offers. According to Hidalgo and Hausmann (2011), economic complexity reflects the underlying productive capabilities of firms and nations, and higher complexity indicates greater potential for value creation [1].

The study by Jelvezan et al. (2025) directly supports these findings by empirically validating that firms with complex product portfolios exhibit superior profit margins compared to those focused on simpler products. Their analysis of Iranian manufacturing firms indicated that complexity, when measured using a weighted combination of product ubiquity and revealed comparative advantage, can successfully differentiate high-performing firms from underperformers [3]. Likewise, Brown (2020) observed that in global manufacturing sectors, product complexity is positively associated with operational margins and return on equity, owing to higher barriers to entry and innovation-driven differentiation [4].

Strategically, this supports the resource-based view articulated by Barney (2021), which asserts that unique and inimitable capabilities—such as the ability to produce and manage complex goods—create sustainable competitive advantages [6]. Complex products are typically difficult to replicate, require specialized knowledge, and are embedded in sophisticated value chains. Therefore, firms that master this level of complexity secure a distinctive market position, enabling price premiums and brand differentiation. Johnson (2023) similarly asserts that firms managing economic complexity through innovation are more resilient to market shocks and have more sustainable profit models [5].

Moreover, the findings of this study intersect with Porter's (2020) competitive strategy framework. Porter argues that firms can attain profitability by either achieving cost leadership or differentiation [16]. The results here suggest that complexity serves as a differentiation mechanism: products that are more complex are more likely to be differentiated, enabling firms to move away from price competition and toward value-based pricing. Simon et al. (2017) support this by demonstrating that complexity-based differentiation strategies—particularly in high-technology markets—enhance customer retention and create innovation cycles that further reinforce profitability [17].

Operationally, the interplay between complexity and profitability is also evident in supply chain strategy. Choi et al. (2022) found that supply chain complexity, when appropriately managed, improves financial outcomes through increased flexibility, product customization, and responsiveness to demand shifts [7]. This echoes Wagner's (2011) argument that complexity, although a source of risk, is also a source of strategic opportunity if leveraged correctly [14]. Our results validate this, as firms producing complex goods were also those generating superior accounting profits, suggesting that they are effectively managing operational and logistical complexities as part of their broader strategy.

The findings also align with Williamson’s (2019) institutional theory, which emphasizes the role of firm structure, governance, and market interactions in shaping economic outcomes [20]. Firms embedded in dense networks of production and innovation—hallmarks of economic complexity—develop relational and contractual frameworks that allow them to sustain profitability even under competitive pressures. This also corresponds to Doulattpour et al. (2020), who argue that multi-criteria decision frameworks incorporating complexity, market intelligence, and firm capabilities offer better strategic guidance than conventional single-factor financial models [2].

At a microeconomic level, the integration of complexity theory into financial performance evaluation also advances the discipline of financial analysis. Penman (2013) and Robinson et al. (2022) advocate for multidimensional models of financial statement analysis that incorporate both tangible and intangible asset structures, investment timing, and strategic behavior [18, 19]. This study’s inclusion of CPI as a moderating variable complements this approach by adding a forward-looking, innovation-centered dimension to profitability assessment.

Lastly, the strategic importance of innovation and market competition must be considered. Javeed et al. (2020) suggest that firms operating under strong environmental regulations and competitive pressures perform better when they leverage market-oriented strategies tied to complex product development [21]. Jiang (2019) offers similar insights, showing that startups developing high-complexity technologies, although initially less profitable, eventually outperform less complex peers in terms of growth and sustainability [15]. These findings, together with the current results, offer a persuasive narrative: complexity is no longer merely a structural attribute—it is a strategic imperative.

While this study offers significant contributions to understanding the relationship between economic complexity and firm profitability, it is not without limitations. First, the analysis is limited to 286 profitable firms from the Fortune Global 500 list, potentially excluding insights from smaller, less profitable, or emerging-market firms where complexity dynamics may differ. Second, the CPI is derived from secondary data sources, which may carry measurement limitations or inconsistencies across reporting standards. Third, the five-year panel may not fully capture long-term fluctuations in complexity-related profitability, especially for firms with long product development cycles.

Future research could expand the dataset to include non-profitable or mid-sized firms to explore whether the observed relationships hold across different performance tiers. Longitudinal studies spanning a decade or more would offer deeper insights into how complexity affects profitability over time and during market disruptions. Moreover, integrating qualitative methodologies—such as case studies or executive interviews—could reveal how managerial perceptions of complexity influence financial decision-making. Exploring sector-specific effects (e.g., pharmaceuticals, aerospace, ICT) would also refine the applicability of the CPI framework.

Executives should treat product complexity not as a constraint but as a strategic asset. Investment in capabilities that support the design, development, and delivery of complex products—such as R&D infrastructure, supply chain flexibility, and cross-functional coordination—can yield significant financial returns. Financial planners and analysts are encouraged to incorporate complexity-based metrics like CPI in their profitability forecasts. Finally, strategic decision-makers should align resource allocation with complexity potential to ensure sustained competitive advantage and superior financial performance.

Authors' Contributions

Authors equally contributed to this article.

Ethical Considerations

All procedures performed in this study were under the ethical standards.

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Conflict of Interest

The authors report no conflict of interest.

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