AI Usage and Financial Performance

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AI usage is strongly and positively correlated with financial strength across industries ($R^2 = 0.91$, p ¡ 0.001).

Background

Artificial Intelligence (AI) integration and perception have varied widely across industries in recent years (OECD 2025; McKinsey report, 2018). While sectors such as finance and logistics appear to embrace AI for efficiency and innovation, creative industries exhibit more skepticism, reflecting concerns about job loss, intellectual property risks, and ethical concerns. Prior research identifies technological capability and organizational factors as key to successful AI implementation (Merhi, 2023). This project examines whether cross-industry patterns of AI adoption correlate with differences in firm performance, profitability, growth, and efficiency, combining U.S. Census Bureau AI survey data with S&P 500 financial indicators. Preliminary results indicate that financial strength, proxied by firm size and recent growth is positively associated with a firm's likelihood of deploying AI in production.

Research question: Does AI usage correlate with financial performance across industries?

Results

A strong, positive relationship was found between a sector's financial performance and its rate of AI implementation. Firstly, correlation analysis suggests the strongest positive correlations between AI usage with and Market Value, Revenue Growth and P/E Multiple. Secondly, a linear regression model demonstrated a good overall fit and revealed a statistically significant and positive effect of Revenue Growth on AI usage. However, the sample size was very small and the model risked overfitting, so the results should only be viewed as exploratory. In Principal Component Regression, to create a comprehensive measure, an index representing "financial strength" was constructed based on Market Value, Sales Growth, P/E multiple, and R&D Expense. This composite index was designed to reduce multicollinearity and capture the underlying variance structure in the data. The PCA confirmed that the there is a strong positive relationship between "financial strength" and AI usage in a sector.

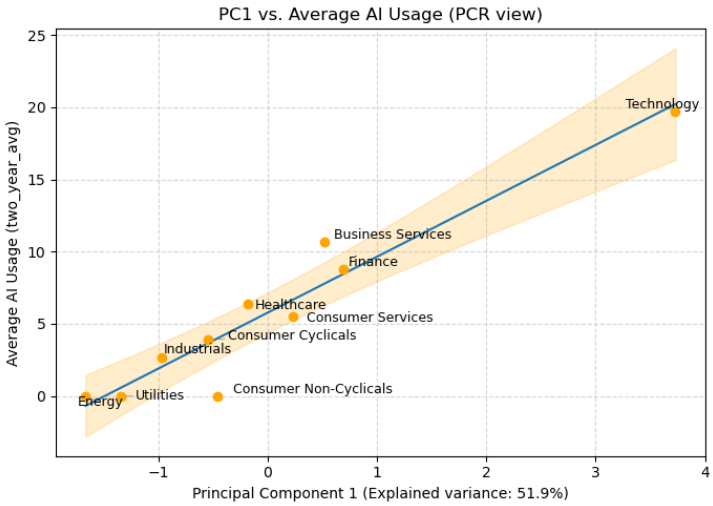

Figure 1: PC1 result

$$PC1 = 0.59(MarketValue) + 0.53(RevenueGrowth) + 0.47(R\&DIntensity) + 0.39(P/EMultiple) \quad (1)$$

The first principal component (Equation 1) explained a large share of the variance across the financial variables (51,9%) and suggests that overall financial strenth is a key enabler of AI adoption (demonstrated in Figure 1). With an R^2 value of 0.91 and a coefficient with a p-value of less than 0.001, the model demonstrates a good fit and robustness. In conclusion: There is a positive relationship between AI usage and financial performance of a given sector.

Limitations: Given that the sample size (number of sectors) is small (n = 10), the statistical significance of the results is limited. In linear regression, there is a possibility of multicollinearity and overfitting and some coefficients are statistically insignificant. In order to strengthen the statistical power of the study, the sample size should be expanded in further studies. We also recommend a further investigation on causal inference between use of AI and financial strength.

References

[1] OECD. (2025). The Adoption of Artificial Intelligence in Firms.

[2] Merhi, M. I. (2023). An evaluation of the critical success factors impacting artificial intelligence implementation. International Journal of Information Management, 69, 102545. Retrieved October 2025

[3] McKinsey & Company (2018) Notes from the AI Frontier: Insights from Hundreds of Use Cases. Retrieved October 2025

Code

[1] Code Repository

Data

[1] U.S. Census Bureau. (2025). Business Trends and Outlook Survey (BTOS). Retrieved September 2025

[2] FactSet. (2025). Financial data for selected firms and industries. FactSet Research Systems Inc. Retrieved September 2025

Figures

[1] Two-Year Average AI Usage by Sector

[2] Market Value, EBITDA Margin, and Sales Growth by Sector (Ordered by AI Usage)

[3] AI Usage Rate vs Market Value by Sector

[4] ROE, P/E Ratio, and R&D Intensity by Sector

[5] AI Usage Rate vs Growth Rate by Sector