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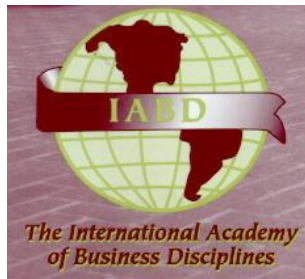
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Editorial Note

The May 2026 issue of the *Journal of International Business Disciplines (JIBD)* has been the result of a rigorous process of blind reviews, and in the end, the reviewers recommended three articles for publication in this issue of *JIBD*.

JIBD is committed to maintaining high standard of quality in all its publications.

Ahmad Tootoonchi, Chief Editor
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**CO-INTEGRATION AND LONG-TERM EQUILIBRIUM RELATIONSHIPS
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CO-INTEGRATION AND LONG-TERM EQUILIBRIUM RELATIONSHIPS BETWEEN FINANCIAL RATIOS AND MACROECONOMIC VARIABLES

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ABSTRACT

In this study, we investigate the co-integration and long-term equilibrium relationships between each of five important ratios (debt-to-equity ratio, return on equity, return on assets, current ratio, and price-to-book ratio) and the macroeconomic variables (GDP, inflation, 10-year bond rate, and unemployment rate). The companies considered in the study were those listed on the Dow Jones Industrial Average. Results indicated that in 43 cases, inflation was co-integrated and had long-term positive equilibrium relationships with all the ratios. Less important was the co-integration with the bond rate and the unemployment rate. In 11 cases, the bond was co-integrated and had a long-term positive equilibrium relationship with financial ratios. In only 6 cases, the unemployment rate was co-integrated and had positive long-term equilibrium relationships with the financial ratios. GDP was not co-integrated with any of the financial ratios.

INTRODUCTION

Financial ratios play a crucial role in assessing a company's financial performance, including its profitability, liquidity, and solvency. Their uses are important to commercial and investment bankers, as well as to individual investors.

In this study, we consider five important ratios: current ratio (CR), debt-to-equity ratio (DER), price-to-book ratio (PB), return on equity (ROE), and return on assets (ROA). The current ratio is the ratio of current assets to current liabilities. Current assets include cash, accounts receivable, inventory, and other assets that are expected to be liquidated within one year. Current liabilities include accounts payable, wages, taxes payable, short-term debt, and the current portion of long-term debt. The current ratio is a liquidity ratio that measures a company's ability to pay its short-term obligations. Also, it is an indication of a company's short-term solvency. A current ratio of less than 1.00 may indicate that the company lacks sufficient capital to meet its short-term

obligations. On the other hand, a current ratio larger than 1.00 indicates the company has the resources to stay solvent in the short term.

The debt-to-equity ratio is the ratio of total liabilities to total shareholders' equity. It is a key financial measure that determines the extent to which a company finances its operations through debt. Investors use the DER to evaluate the company's financial leverage (the extent to which a company is using debt to leverage its assets). A high DER is associated with high risk, since the company is financing its operations primarily with debt. If the cost of financing the debt through interest outweighs the increase in earnings, the share values of the company may decline. On the other hand, if an increase in earnings outweighs the cost of the debt, then the share value may increase. It is essential to consider the company's industry when evaluating its DER. Some industries have a higher DER than others, depending on their capital needs and growth rates. For example, utility companies have a high DER compared to the market average. Due to their slow growth and steady income, they can borrow money at a low cost, so their debt cost is relatively low compared to their increased earnings.

The price-to-book ratio is used to compare a company's market valuation to its book value. It is calculated as the ratio of market price per share to book value per share. Market price per share is the share price quoted on the market. Book value per share is calculated as (total assets – total liabilities)/number of shares outstanding. Investors use the PB ratio to identify potential investments. The ratio is often regarded as a reliable indicator of growth. Market analysts widely use the PB ratio. Traditionally, a value less than 1.0 is considered a good PB value for investors, indicating an undervalued stock and therefore a good investment.

Return on equity is net income of the company divided by its shareholder equity (calculated as assets – liabilities). ROE is considered as an indicator of a company's profitability and its efficiency in generating profits. Also, ROE is useful in assessing a company's stock and dividend growth rates. Return on equity varies across different industry sectors, so it is best to compare a company's ROE to the average for its sector. An extremely high ROE is a good thing if a company's performance is so strong that its net income is large compared to its shareholder equity. However, at the same time, one should be wary of an extremely high ROE, as it may be due to a small shareholder equity (resulting from excessive debt) compared to net income, which indicates a higher risk.

Return on assets is calculated as net income divided by total assets. It is a measure of how efficiently a company generates profit. The higher the ROA ratio, the better, as it indicates greater asset efficiency. As such, investors may use ROA to find good investment opportunities. ROA varies by industry sector, so it is prudent to compare a company's ROA value to the average ROA in its sector. One may also examine the ROA trend over time. A rising trend indicates a profitable company. ROA can also be used to compare companies within the same industrial group or sector.

The five financial ratios listed above are crucial for investors in evaluating a company's performance and making informed investment decisions. It is important to determine how a company's financial ratio relates to the economy of a country by studying long-term equilibrium relationships between a specific financial ratio and key macroeconomic variables. There is a lack of such studies in literature.

In this study, we employ time series co-integration analysis and the vector error correction model to investigate the long-term equilibrium relationships between a financial ratio and four macroeconomic variables: gross domestic product, unemployment rate, bond rate, and inflation rate.

LITERATURE REVIEW

Arkan (2016) investigated the effect of financial ratios on predicting stock price on the Kuwaiti financial market (an emerging market) for the years 2005- 2014. Results of the multiple regression analysis using the stepwise procedure showed that the most influential ratios, which had a significant and positive effect on stock prices in the industrial sector, were return on assets (ROA), return on equity (ROE), and net profit. The most effective ratios for the service and investment sectors were the price-earnings ratio (P/E), earnings per share (EPS), ROA, and ROE.

Erdoğan et al. (2015) studied the impact of financial ratios on the corporate financial performance of companies listed on the Borsa İstanbul-30 (BIST-30) for the period 2002-2013. Panel regression was used in the analysis. The independent variables were current ratio, earnings per share, leverage ratio, firm size, and market-to-book value ratio. The dependent variable was net profit margin. Results showed a positive and significant relationship between corporate performance, corporate size, and current ratio. Additionally, a negative and significant relationship was found between corporate performance and the leverage ratio.

Restianti and Agustina, L. (2018) investigated the effects of the current ratio, the retained earnings to total assets, earnings before interest and tax to total assets, return on equity, debt to assets ratio, and total assets turnover on the financial distress of 35 companies listed on the Indonesia Stock Exchange (IDX) for the period 2013-2015. Results from the logistic regression showed that earnings before interest and tax to total assets and return on equity had a significant negative impact on the financial distress of companies.

Bolek and Gniadkowska-Szymańska (2019), using logistic regression analysis, showed that the current ratio was negatively related to the economic condition of companies as measured by earnings per share and profitability. The study was conducted on a group of companies listed on the Warsaw Stock Exchange for the period from April 30, 2012, to October 31, 2017.

Soni and Tiwari (2020) investigated the effects of current ratio, capital adequacy ratio, and the net nonperforming assets (NPA) ratio on the net profit ratio representing the profitability of banks in India. Ten banks were considered in the study: the top five public sector banks and the top 5 private sector banks. The data gathered was over the period 2016-2018. Using regression and correlation analyses, results revealed that NPA and current ratios had a significant negative relationship, and capital adequacy had a significant positive relationship with profitability.

Ragesh (2020) presented logit and probit regression models to predict the probability of default of borrowers using ten ratios (revenue growth, EBITDA margin, net margin, return on equity, debt equity ratio, inventory turnover, debtors turnover, payables, cash conversion cycle and sales to net

fixed assets) commonly used in credit appraisal. Results indicated that EBITDA margin, net margin, debt-to-equity ratio, and return on equity were most important in predicting the probability of default.

Karakus and Bozkurt (2017) investigated the effects of financial ratios and macroeconomic factors on stock returns in 58 companies listed on the BIST-100 index for the period 2006 - 2015. Using panel regression, results indicated that the debt ratio was negatively related to stock returns. Return on assets and net working capital turnover were positively related to stock returns. Inflation had a negative effect on returns. On the other hand, unemployment, gross domestic product, net inflows of portfolio equity, and exchange rates positively affected stock returns.

Demirhan and Anwar (2014) investigated the factors that affected the performance of 140 non-financial companies on the Borsa Istanbul market during the 2008 financial crisis. Performance was measured by the market-to-book ratio. The independent variables were grouped into four factors, using factor analysis. Multiple regression analysis was used to regress performance on the four factor scores. Results showed that the liquidity factor (composed of the current ratio and acid-test ratio) had a positive effect on performance and the leverage factor (composed of return on equity and debt-to-equity ratio) had a negative effect on performance during the financial crisis.

Gerald et al. (1997) studied the effects of company size and price-to-book-value on stock returns during the Federal Reserve's expansive and restrictive policy periods. It was found that the effects of size and price-to-book value on stock returns were statistically significant only during expansive monetary policy periods. The effects were small and, in some instances, negative in restrictive policy periods.

Marangu and Jagongo (2015), using multiple linear regression analysis, investigated the effects of dividend payout ratio, return on total assets, return on equity, return per share, dividend per share, and growth rate of earnings after tax on price-to-book ratio for companies quoted at the Nairobi Securities Exchange (NSE). Results indicated a significant positive relationship between the price-to-book ratio and returns on total assets, equity, and per share. The dividend per share had a significant negative effect on the price-to-book ratio.

Widajatun and Ichsani (2019) investigated the impact of several variables on the return on assets (ROA) of commercial banks in Indonesia for the period from January 2014 to December 2016. The authors employed multiple linear regression, where ROA was the dependent variable, with non-performing loans (credit risk), market risk, liquidity risk (as measured by the loan deposit ratio), and operating revenue and expenses (operational risk) as the independent variables. The results of the regression analysis showed that credit risk and operational risk had significant negative effects on return on assets.

Gök and Çankal (2020), using co-integration and Granger causality analyses on weekly bond yield and stock indices for the period April 1, 2005, to December 30, 2016 in Turkey, reported that stock indices and bond yields were co-integrated. Additionally, a bidirectional causal relationship existed between the two variables.

Bolokwe and Radikoko (2017) studied the effect of inflation (CPI) on equity market returns, using a Vector Autoregressive (VAR) estimation approach. The data were collected monthly and spanned the period from January 2002 to December 2014. Results showed that inflation had a significant negative impact on stock returns. Furthermore, the negative impact of shocks in the CPI persisted over a long period.

Faff and Heaney (1999) empirically investigated the effect of expected inflation on equity returns at the market and industry levels. The authors used monthly and quarterly data from Australia for the period January 1974 to March 1996. Inflation was measured by three indices: the consumer price index (CPI), the manufactured materials used index (MMU), and the manufacturing articles produced index (MAP). The basic results of the analysis indicated that there was little evidence for a consistent relationship between equity returns and inflation.

Ansari (2020) examined the effects of company profitability, efficiency, liquidity, and leverage on the return-on-equity (ROE) of Indian IT companies listed on NSE. The analysis was based on multiple linear regression using data from nine IT companies from 2004-05 to 2018-19. Results showed that profitability had the most significant impact on ROE, followed by efficiency and leverage. All three independent variables were positively related to ROE. On the other hand, liquidity had a significant negative relationship with ROE.

Hashim (2020) investigated the effects of financial ratios on the share price of the consumer industry. Data were gathered on 36 consumer companies listed on the Bursa Malaysia Main Board from 2004 to 2019. Results from the multiple linear regression random effect model showed that return on equity had a highly significant positive effect on share price ($p = 0.000$). Debt-to-equity ratio and current ratio had no effect on share price.

Ligocká (2019) analyzed the relationship between financial factors and the stock prices of food, energy, metallurgical, and chemical companies listed on the Polish Stock Exchange over the 2006–2015 period. Results of the Johansen test for co-integration or long-term equilibrium between stock price and financial ratios indicated that the stock price of the energy companies was co-integrated with return on equity (ROE), debt ratio (DR), equity ratio (ER), financial leverage (FL), and the acid test (L2). Also, the stock price of the food, metallurgical, and chemical companies was co-integrated with return on assets (ROA), ROE, DR, ER, FL, and L2.

Thus far, the literature on this subject often examined short-term relationships using regression analysis. In this study, we employ the proper co-integration approach for time series analysis to investigate the long-term relationships between variables.

METHOD

Co-integration and vector error correction model

Two non-stationary time series are co-integrated if there is a linear combination of the two variables that is stationary or I (0). Two co-integrated variables that are I(1) (i.e., stationary upon first differencing) can be analyzed using the Vector Error Correction Model (Johansen, 1988, 1991). For two variables with one co-integrated vector, the model can be expressed as:

$$D_Y_{it} = C + \alpha\beta' Y_{it-1} + \sum_{i=1}^{p-1} \delta_i D_Y_{it-1} + E \quad (1)$$

Where C is a constant, D_Y_{it} is a 2x1 column vector of first differences for the two variables (y_{1t} , y_{2t}), α is a 2x1 column vector, β' is a 1x2 row vector, δ_i is a 2x2 matrix, and E is the random error term. The expression $\alpha\beta' Y_{it-1}$ gives the long-term relationship or equilibrium between the two variables, and $\sum_{i=1}^{p-1} \delta_i D_Y_{it-1}$ gives the short-term relationship.

The value p, for the number of lags, can be chosen based on the Schwartz and Akaike criteria. The normalized co-integrated vector, $(1, -\beta_2) Y_{it} = y_{1t} - \beta_2 y_{2t}$, gives the long-term linear relationship between the two variables. This implies that, at equilibrium, $y_{1t} = \beta_2 y_{2t}$. The elements of the α column vector give the speed at which the change in the dependent variables return to the equilibrium value when deviations from equilibrium occur. This is given by the following equations:

$$D_y_{1t} = \alpha_1 (y_{1t-1} - \beta_2 y_{2t-1}) \quad (2)$$

$$D_y_{2t} = \alpha_2 (y_{1t-1} - \beta_2 y_{2t-1}) \quad (3)$$

Multiplying both sides of (3) by β_2 and subtracting the two equations, one arrives at the following relationship:

$$y_{1t} - \beta_2 y_{2t} = (1 + \alpha_1 - \alpha_2 \beta_2) (y_{1t-1} - \beta_2 y_{2t-1}) \quad (4)$$

The absolute value of $(1 + \alpha_1 - \alpha_2 \beta_2)$ or $Abs(1 + \alpha_1 - \alpha_2 \beta_2)$ must be less than 1 for the long run linear relationship, $(y_{1t} - \beta_2 y_{2t})$, to be stationary or stable.

DATA

Quarterly data on the macroeconomic variables (GDP, inflation, unemployment rate, and 10-year bond rate) were retrieved from FRED (Federal Reserve Bank of St. Louis) at <https://fred.stlouisfed.org> for the years 2005-2021. Quarterly data, for the same period, for the financial ratios (debt-to-equity ratio, current ratio, return on equity, return on assets, and price-to-book ratio) of different companies listed on the Dow Jones Industrial Average were obtained using

Macrotrends. Co-integration and equilibrium relationships between a financial ratio and each of the macroeconomic variables were investigated using the Johansen co-integration test and the vector error correction model.

The interest in studying the Dow Jones Industrial Average (Dow) companies stemmed from their importance in gauging the country's economy and the Dow's positive long-term relationship with the GDP. In this case, companies can be considered the population (Zar, 1984). From a statistical perspective, this is a fixed model, in that the conclusions drawn apply specifically to the companies under study and may not necessarily be applicable beyond them.

RESULTS AND DISCUSSION

Table 1 presents pairs of co-integrated variables and their linear long-term relationships at equilibrium. Of interest is the finding that inflation (CPI) is overwhelmingly co-integrated with financial ratios. In 22 of the companies, there is co-integration between CPI and at least one financial ratio. There were 43 cases where CPI was co-integrated with a financial ratio. Inflation and ROA were co-integrated in 10 cases or companies. Inflation and ROE were co-integrated in 7 cases. Inflation and CR were co-integrated in 7 cases. In 9 companies, inflation and DER were co-integrated. Also, inflation and PB were co-integrated in 10 of the companies.

Co-integration implies that the two variables move together over time. The distance between the two variables remains stable over time, indicating a long-term equilibrium relationship between them. From the linear long-term relationship at equilibrium in Table 1, it is seen that there is a positive relationship between inflation and each of the financial ratios. At equilibrium, the relationship is of the form $y_{1t} = \beta_2 y_{2t}$ where y_{1t} is a financial ratio and y_{2t} is CPI. It is of interest to discover that inflation has a positive long-term relationship with each of the financial ratios. The positive relationship between inflation and ROA may be interpreted to mean that companies benefit from inflation in that they are able to increase prices, in the name of inflation, beyond the inflation cost. The positive relationship between inflation and return on equity can be due to reduced value on the equity caused directly or indirectly by inflation or an increase in income due to higher prices imposed by the company. Debt-to-equity ratio will have a positive relationship to inflation if equity value is reduced due to inflation. A positive long-term relationship between CPI and PB can be due to decreased book value relative to market price per share due to inflation. An increase in current assets relative to current liabilities under inflation can explain the long-term positive relationship between the current ratio and inflation.

Next to inflation, it is observed that, in 11 cases, the bond rate has a positive long-term relationship with DER, ROE, CR, and PB. The positive equilibrium relationship with DER and ROE may indicate a reduction in equity value due to an increase in bond rate. Unemployment had a positive equilibrium relationship, in six cases, with CR, ROE, and PB. By far, CPI is the most important macroeconomic variable in terms of having long-term equilibrium relationships with financial ratios. It is of interest that GDP was not co-integrated with any of the financial ratios.

The long-term equilibrium relationships in Table 1 are stable or stationary since, in all instances, the absolute value of $(1 + \alpha_1 - \alpha_2\beta_2)$ is less than 1. As shown in Equations (2) and (3), α_1 and α_2 give the speed at which the change in the dependent variables (financial ratios) return to the equilibrium value when deviations from equilibrium occur.

TABLE 1. CO-INTEGRATED VARIABLES AND THEIR LONG-TERM EQUILIBRIUM RELATIONSHIPS FROM THE VECTOR ERROR CORRECTION MODEL. THE DATA USED WERE QUARTERLY, FROM 2005 TO 2021.

Firm	Co-integrated variables	Linear combination of the two variables at equilibrium, $y_{1t} - \beta_2 y_{2t}$ or $y_{1t} = \beta_2 y_{2t}$	Speed of adjustments (α_1 and α_2) to deviations from equilibrium
McDonald	ROA, CPI	ROA = 0.0305 CPI	$\alpha_1 = -0.12247$ $\alpha_2 = -0.06687$
3M	CR, CPI	CR = 0.0090 CPI	$\alpha_1 = -0.29110$ $\alpha_2 = -0.10411$
American Express	ROA, CPI	ROA = 0.068 CPI	$\alpha_1 = -0.00508$ $\alpha_2 = -0.12591$
Amgen	CR, CPI	CR = 0.09528 CPI	$\alpha_1 = -0.00696$ $\alpha_2 = -0.08629$
Apple	DER, Bond	DER = 0.09613 bond	$\alpha_1 = 0.05082$ $\alpha_2 = -0.00690$
	ROA, CPI	ROA = 1.23245 CPI	$\alpha_1 = -0.00153$ $\alpha_2 = -0.00468$
	ROE, Bond	ROE = 7.30820 Bond	$\alpha_1 = 0.09468$ $\alpha_2 = -0.0002577$
	ROE, CPI	ROE = 0.27849 CPI	$\alpha_1 = 0.18202$ $\alpha_2 = 0.02834$
	ROE, Unempl	ROE = 4.11044 Unempl	$\alpha_1 = 0.13814$ $\alpha_2 = 0.00887$
Boeing	CR, CPI	CR = 0.04689 CPI	$\alpha_1 = -0.00271$ $\alpha_2 = -0.14165$
	CR, Unempl	CR = 0.19295 Unempl	$\alpha_1 = -0.05999$ $\alpha_2 = 0.59775$
	ROA, CPI	ROA = 0.16565 CPI	$\alpha_1 = 0.02028$ $\alpha_2 = -0.04134$
Caterpillar	ROE, Bond	ROE = 8.1937 Bond	$\alpha_1 = -0.10673$ $\alpha_2 = -0.00375$
Cisco	CR, CPI	CR = 0.05603 CPI	$\alpha_1 = -0.00357$ $\alpha_2 = -0.17927$
	DER, CPI	DER = 0.08040 CPI	$\alpha_1 = -0.00240$ $\alpha_2 = -0.07141$
Coca Cola	CR, Bond	CR = 0.45344 Bond	$\alpha_1 = 0.02057$ $\alpha_2 = 0.15954$

	CR, CPI	CR = 0.00432 CPI	$\alpha_1 = -0.00570$ $\alpha_2 = 0.71589$
	DER, CPI	DER = 0.11710 CPI	$\alpha_1 = -0.11847$ $\alpha_2 = 0.41985$
Disney	ROA, CPI	ROA = 0.14902 CPI	$\alpha_1 = 0.02548$ $\alpha_2 = -0.06470$
Goldman	DER, Bond	DER = 4.77056 Bond	$\alpha_1 = -0.39905$ $\alpha_2 = 0.00259$
	PB, Bond	PB = 0.32067 Bond	$\alpha_1 = -0.38290$ $\alpha_2 = -0.14297$
IBM	DER, CPI	DER = 0.10339 CPI	$\alpha_1 = -0.02352$ $\alpha_2 = -0.09470$
	PB, CPI	PB = 0.12065 CPI	$\alpha_1 = -0.01763$ $\alpha_2 = -0.08241$
	ROA, CPI	ROA = 0.35621 CPI	$\alpha_1 = 0.00347$ $\alpha_2 = -0.01932$
	ROE, CPI	ROE = 1.45603 CPI	$\alpha_1 = -0.00117$ $\alpha_2 = -0.00578$
INTEL	DER, CPI	DER = 0.03032 CPI	$\alpha_1 = -0.00442$ $\alpha_2 = -0.20433$
Merck	DER, CPI	DER = 0.05207 CPI	$\alpha_1 = -0.09392$ $\alpha_2 = 0.31043$
	PB, CPI	PB = 0.30143 CPI	$\alpha_1 = -0.08243$ $\alpha_2 = 0.07219$
	ROE, Bond	ROE = 3.41569 Bond	$\alpha_1 = -0.03265$ $\alpha_2 = 0.00363$
	ROE, CPI	ROE = 0.1856 CPI	$\alpha_1 = -0.16078$ $\alpha_2 = 0.00595$
Microsoft	CR, CPI	Cr = 0.03378 CPI	$\alpha_1 = -0.22559$ $\alpha_2 = 0.19158$
	PB, CPI	PB = 0.36581 CPI	$\alpha_1 = -0.05125$ $\alpha_2 = 0.05380$
Nike	CR, Unempl	CR = 0.44851 Unempl	$\alpha_1 = 0.01225$ $\alpha_2 = 0.40831$
	PB, CPI	PB = 0.1500 CPI	$\alpha_1 = 0.01225$ $\alpha_2 = 0.02192$
	ROE, CPI	ROE = 0.95083 CPI	$\alpha_1 = -0.00510$ $\alpha_2 = -0.00714$
Salesforce	PB, Bond	PB = 1.63953 Bond	$\alpha_1 = -0.33978$ $\alpha_2 = -0.01654$
	PB, Unempl	PB = 0.42843 Unempl	$\alpha_1 = -0.21382$ $\alpha_2 = 0.01384$
	ROA, CPI	ROA = 0.31826 CPI	$\alpha_1 = -0.09920$ $\alpha_2 = 0.01500$

	ROE, CPI	ROE = 0.43776 CPI	$\alpha_1 = -0.09690$ $\alpha_2 = 0.00872$
Travelers	DER, Bond	DER = 0.09534 Bond	$\alpha_1 = -0.20397$ $\alpha_2 = 0.02492$
	DER, CPI	DER = 0.00435 CPI	$\alpha_1 = -0.15483$ $\alpha_2 = 0.12353$
	PB, CPI	PB = 0.02796 CPI	$\alpha_1 = -0.16167$ $\alpha_2 = 0.01761$
United Health	DER, CPI	DER = 0.02620 CPI	$\alpha_1 = -0.20815$ $\alpha_2 = -0.07344$
	ROA, CPI	ROA = 0.02115 CPI	$\alpha_1 = -0.13248$ $\alpha_2 = 0.11660$
	ROE, CPI	ROE = 0.15075 CPI	$\alpha_1 = -0.02819$ $\alpha_2 = 0.08398$
Verizon	DER, CPI	DER = 0.13242 CPI	$\alpha_1 = -0.10336$ $\alpha_2 = -0.02117$
	PB, CPI	PB = 0.22500 CPI	$\alpha_1 = -0.10582$ $\alpha_2 = -0.03140$
	ROA, CPI	ROA = 0.30707 CPI	$\alpha_1 = -0.23290$ $\alpha_2 = -0.02471$
Visa	CR, Unempl	CR = 0.36343 Unempl	$\alpha_1 = -0.36343$ $\alpha_2 = 0.11477$
	PB, CPI	PB = 0.44790 CPI	$\alpha_1 = -0.42341$ $\alpha_2 = -0.03478$
	RAO, CPI	ROA = 0.55189 CPI	$\alpha_1 = -0.80518$ $\alpha_2 = -0.00589$
	ROE, CPI	ROE = 0.3899 CPI	$\alpha_1 = -0.06918$ $\alpha_2 = -0.01691$
Walgreen	DER, CPI	DER = 0.06638 CPI	$\alpha_1 = -0.01860$ $\alpha_2 = 0.53797$
	PB, CPI	PB = 0.00726 CPI	$\alpha_1 = -0.18335$ $\alpha_2 = -0.04530$
	ROA, Bond	ROA = 4.18605 Bond	$\alpha_1 = -0.11320$ $\alpha_2 = 0.00913$
	ROE, Bond	ROE = 0.00502 Bond	$\alpha_1 = -2.10809$ $\alpha_2 = 0.22048$
Walmart	PB, CPI	PB = 0.10056 CPI	$\alpha_1 = -0.16215$ $\alpha_2 = 0.07039$
	ROE, Unempl	ROE = 2.26902 Unempl	$\alpha_1 = -0.10484$ $\alpha_2 = 0.10618$
Johnson and Johnson	CR, CPI	CR = 0.06488 CPI	$\alpha_1 = 0.00109$ $\alpha_2 = -0.11324$
	PB, CPI	PB = 0.03374 CPI	$\alpha_1 = 0.00947$ $\alpha_2 = 0.06936$

CONCLUSION

In this study, we investigated co-integration and long-term equilibrium relationships between each of five important financial ratios (debt-to-equity ratio, price-to-book ratio, current ratio, return on assets, and return on equity) and each of four influential macroeconomic variables (GDP, inflation, 10-year bond rate, and unemployment rate). The companies considered were those listed on the DOW Jones Industrial Average.

Two variables are co-integrated when they move together over time and have a long-term, stable equilibrium relationship. Results indicated that, in 43 cases, inflation was co-integrated and had a stable positive equilibrium relationship with each of the financial variables. Bond rate was, in 11 cases, co-integrated and had long-term positive equilibrium relationships with the financial ratios. Only in 6 cases was the unemployment rate co-integrated with long-term positive equilibrium relationships with the financial ratios. In all cases, the equilibrium relationship was stationary or stable. It is of interest that GDP was not co-integrated with any of the financial ratios.

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MOTOR CARRIER PERFORMANCE EFFICIENCIES THROUGH HORIZONTAL COLLABORATIVE TRANSPORT

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ABSTRACT

Motor carrier transportation forms the bulk of the total transportation and logistics cost in the US economy. It is also a significant portion of the total cost of most of the products that are sold in US markets. This makes it very important to control motor carrier transportation cost. There is a long history of efforts directed towards improving the efficiency of motor carriers. Horizontal transport collaboration (HCT) is among the recent initiatives directed towards achieving cost reductions in motor carrier transportation. HCT is typically enabled through electronic marketplaces (EMs). The literature asserts that there is very limited research on HCT among motor carriers. This research tries to address this gap in literature. Our results, through the use of real-world shipment data in our simulation modeling, add to the evidence of efficiency benefits that could be achieved by motor carriers through HCT by participating on EMs.

INTRODUCTION

Trucking forms the bedrock of the US logistics and distribution systems. At almost 932 billion, it accounts for more than 60% of total transportation cost (across all modes of transportation such as motor carriers/trucks, parcel, rail, air, water transport and pipeline) and about 40% of business logistics cost in the US (Zimmerman et al., 2024). Over the years, the enormous size of truck transportation expenses has made it a focus of researchers and various players of this industry to improve efficiency and reduce cost.

Though there have been ongoing efforts to improve transportation efficiency, transportation systems are far from being optimized. Transportation inefficiencies contribute to economic, social and environmental unsustainability. There are several examples of transportation inefficiencies found in literature. For example, it was found that trucking in Europe typically shows 12% empty trips. On average, 22% trips were made by empty trucks in most of the EU countries (Eurostat, 2021). Further, road transportation was found as the single largest contributor to greenhouse gas emissions, contributing as much as 72% of all emissions across the entire transport industry. Transportation was found to contribute an estimated 15% of total greenhouse gas emissions (Directorate-General for Mobility and Transport, 2018). These negative outcomes have been

increasing despite ambitious reduction targets. This highlights the huge potential of achieving great improvements, through better transportation efficiency, in reducing the adverse effects truck transportation may have upon the tangible and intangible outcomes such as logistics cost, environmental and social impact.

The next section presents the extant literature on logistics collaboration in general and horizontal collaborative transportation (HCT) in particular. Based on the literature review, we highlight the gaps in the existing literature. This leads us to our research question. In the subsequent sections we present the research design, describe our simulation model and present the results and related discussion. Lastly, we summarize with our conclusions and point out the limitations of our research.

LITERATURE REVIEW

Trucking accounts for a large portion of the total cost of the majority of the products that are produced and distributed in the economy (Suzuki & Lu, 2017; Büyükkaramikli et al., 2014). This implies that trucking cost may be a major driver of total cost of a product. For this reason, reducing truck transportation costs has always been very important for the two major parties involved in distributing the product through road transportation, shippers and carriers alike. Given the appreciation for increased transportation efficiency, companies have been making their best efforts to optimize transportation operations. These traditional, intra-organizational efforts at improving transportation to reduce cost, improve efficiency and increase profits seem to have reached a stage where there doesn't seem to be great potential for significant additional improvements (Muñoz-Villamizar et al., 2019). This has led the various parties involved to look at performance improvements through inter-organizational initiatives and has resulted in various "vertical" and "horizontal" collaborative arrangements.

Vertical collaboration involves companies at different stages of the same supply chain. Some of the examples are collaboration between buyers and suppliers to achieve efficiency improvements through information sharing on demand and inventories. Collaboration with suppliers and customers have been shown to result in improved performance in terms of shorter lead times, better financial performance, and improved customer service etc. (Vickery et al., 2003). Vertical collaboration in the food industry supply chain was shown to benefit companies to improve their inventory management. In collaborative supplier-customer relationships, sharing of demand information or advanced commitments from customers may help suppliers reduce the inventory cost (Reddy & Rajendran, 2005). Collaboration through information sharing between supply chain partners has been shown to reduce supply chain costs by as much as 12% (Cachon & Fisher, 2000). In the context of transportation, vertical collaboration between trucking companies and container terminals may reduce the turnaround time for trucks, increase the equipment utilization for container terminals and reduce the congestion levels at the gates (Azab et. al., 2020). Collaborative transportation management (CTM) between retailers and carriers is associated with reduced total cost for retailers and increased service levels (Chan & Zhang, 2011). The field of vertical collaboration has seen a lot of research activity and seems to be much more mature compared to horizontal collaboration. There are several literature survey studies that compile the research

related to vertical collaboration (for example, Barratt, 2004; Power, 2005; Kanda et al., 2008; Stadler 2009).

Horizontal Collaborative Transportation (HCT)

Horizontal collaboration is more recent and relates to collaboration among potentially competing or unrelated companies that are at the same level across different supply chains. There are instances of collaboration among various parties such as between shippers (Yilmaz & Savasneril, 2012), carriers (Dai & Chen, 2012), logistics service providers (Albers and Klaas-Wissing, 2012), retailers (Ballot & Fontane, 2010), and receivers or customers (Crujssen et. al., 2007). In logistics, most of the horizontal cooperation is seen with the primary objective of achieving transportation efficiencies. Referred to as “horizontal transport collaboration” (HTC), more often than not, this is achieved by consolidating shipments of multiple partners in fewer trucks leading to efficiency gains in terms of reduced transportation cost, lesser pollution and contributing to environmental sustainability (Karam et. al, 2021; Pan et. al., 2019). Studies have shown that HTC may reduce cost anywhere between 4% to 46% and carbon emissions in excess of 20% (Guajardo & Rönnqvist, 2016; Montoya-Torres et al., 2016; Soysal et al., 2018).

So far, there doesn't seem to be a commonly accepted definition of HCT. One of the earlier definitions (Vanovermeire & Sörensen, 2014) suggest that it involves “companies that have similar or complementary logistic needs combine their orders and transport them to their respective customers in a single logistics operation, rather than individually.” As a result, this transportation transaction may have orders from several companies bundled together. A more recent and broader definition of HCT refers to “all types of horizontal cooperation or collaboration in freight transport between players operating at the same level of the supply chain.” Carriers, logistics service providers, shippers or receivers may be among the various parties involved. Collaboration or cooperation could be between independent supply chains and between transport networks, may range from occasional to long lasting, and could be either operational or strategic in nature (Pan et al., 2019).

HCT or horizontal cooperation in transportation is nothing new. For example, eight competing companies producing sweets and candies came together to cooperate with the intent of increasing the efficiency of their transportation operations. As a result, they were able to reduce transportation costs, realize increased customer service and deliver a broader product assortment to their customers (Crujssen et al., 2007). These earlier efforts relied on direct communication between shippers and their carriers, the typical parties involved in cooperation arrangements. Sometimes, a third party, such as a logistics service provider may serve as a facilitator of these collaborative efforts (Crujssen et al., 2007; Esper & Williams, 2003). These types of arrangements have become increasingly sophisticated in their scale, scope, and the variety of solutions offered. In today's world, more often than not they are enabled through and have evolved into electronic marketplaces (EMs) for logistics and transportation (Lafkihi et al., 2020; Pan et al., 2019). Among other things, these EMs serve as electronic communication enabling the transfer of real-time information between collaborating parties which then facilitates various collaboration options among participating entities.

These HCT arrangements/solutions that are typically enabled through transportation EMs may be classified into three categories based on ownership or primary beneficiaries of these collaborative solutions. Some of these HCT solutions are geared towards benefiting participating carriers. For example, HCT solutions may be configured for multiple carriers to collaborate and reduce deadheading, operating costs, and increase capacity utilization (Hernandez & Peeta, 2010; Hernández et al., 2011). Several carriers may serve transportation requests from multiple shippers and realize reduction in repositioning costs (Özener et al., 2011). Carriers may collaborate and exchange lanes to improve operational efficiency of collaborating carriers and reduce total fulfillment cost (Wang & Kopfer, 2014). Multiple carriers may share orders to create delivery routes through collaboration. This reportedly resulted in cost savings between 5% to 15% for such types of arrangements (Crujssen & Salomon, 2004). HTC implemented between two freight carriers in the context of a pickup and delivery problem with time windows, in an illustrative example, resulted in a reduction of 10% in the number of vehicles needed and transportation cost was reduced by more than 12% (Krajewska et al., 2008). HTC to reduce backhauls was found to reduce distance based cost by around 16% (Juan et al., 2014).

In other instances, HCT arrangements may be designed primarily to meet shippers needs. Instead of offering individual shipping lanes, several shippers may collaborate and identify a set of transportation lanes and offer them to a carrier and benefit from cost savings (Kuyzu, 2017). Shipping lane allocations may be done from the shipper's perspective based on various environmental sustainability and non-price factors. Such considerations have the potential to let the carriers reduce empty haul movements through collaboration among shippers. These improvements may lead to reduction in CO2 emissions and cost savings (Basu et al., 2017).

Finally, there are HTC arrangements that are owned and are managed by third parties. E-commerce platforms can perform the function of matching shipments generated by online customer orders with available transport vehicles that may be supplied by various logistics providers. The matching may be done to minimize the total logistics cost (Zhang et al., 2019). Third party brokers often perform a critical role for shippers in the transportation spot market by matching shipper requirements with available carrier capacity and improve the overall outcomes by reducing carrier transportation cost and facilitating shippers search efforts (Lindsey & Mahmassani, 2017). Shippers may collaborate as a shipper's consortium where a third-party logistics provider may facilitate this collaboration combining LTL loads into TL loads. Such arrangements have resulted in significant savings of around 40% of total shipping cost for collaborating shippers (Lai et al., 2022).

These instances in the literature demonstrate the immense promise of HCT in increasing the efficiency of transportation and subsequently realizing substantial benefits. However, research in HTC so far has found that the demonstrated benefits fall far short of high expectations (Basso et al., 2019; Crujssen, 2020). This gap between the promise of HCT regarding various benefits it may deliver and the limited evidence of its application and actual realized benefits may be explained by various barriers and challenges faced in implementing these types of arrangements/solutions. These barriers and challenges are numerous and diverse. They range from organizational factors, governance, mechanisms, behavioral issues, technological challenges, and so on (e.g., Karam et al., 2021).

At the very basic level, often, in an HTC arrangement, partners are typically competitors. This creates issues that are typical in these types of situations like lack of trust and hesitancy in sharing information (Islam et al., 2019). Governance mechanisms such as process formulation and appropriate contracts are important to ensure the longevity and reduce the potential of opportunism of such cooperation arrangements. Such mechanisms enhance the chances of HTC improving the performance of collaborating partners (Raue & Wieland, 2015). Fair distribution of benefits and/or costs of collaboration initiatives is important for the success of such arrangements (Lai et al., 2022). This sometimes may be a source of failure of such arrangements. If this is perceived to be biased or unfair, it may adversely impact these collaborative initiatives (Basso et al., 2019).

Research Question

To summarize, as mentioned earlier, HCT is not necessarily a new concept. However, there are two interesting aspects of the state of research in this field. First, notwithstanding increased activity in recent years (e.g. Gansterer & Hartl, 2020), it has been pointed out that research in this area is rare (Hacardiaux & Tancrez, 2022). Second, research based on actual application using real-world data is especially scarce (Basso et al., 2019; Cruijssen, 2020). Literature is especially lacking in research related to the benefits motor carriers may expect through HCT. A relatively recent article (Collignon & Sternberg, 2020) concluded that “EMs in the motor carrier context represent a white field in supply chain, logistics and information systems research...” Given the paucity of research in this field, we hope to contribute to this literature by conducting a simulation study using real world shipment data and assessing the benefits of HCT for motor carriers by participating and collaborating on transportation EMs.

MODELING FRAMEWORK

It will be useful to briefly explain how conventional transportation may take place between a shipper and a carrier. Typically, a shipper will initiate the transportation transaction based on the volume of its shipments. If these are regular, stable shipping requirements, then the shipper may enter into a contract with a carrier. The contract may specify a certain volume of shipment between the shipper and carrier. The shipper is obligated to provide the agreed upon shipment volume and a carrier has a responsibility to offer an equivalent amount of carrier space to haul the shipments. In a conventional transaction, respective parties may come to know the actual shipping requirements of the shipper and the available capacity of the carrier at the time of the transaction. If either one of the parties defaults on the contract, this results in either shipper not able to ship the shipments or the carrier being left with reduced capacity utilization. Thus, either party defaulting on the contract would have negative outcomes for both sides from these types of situations.

To illustrate this with a simple numerical example, let's assume that the contract size between a shipper and a carrier is 100 units. Consider a scenario where the shipper has 50 units less than the contract quantity of 100. This will result in the carrier utilization being reduced to 50%. The reverse could happen where the carrier may have less capacity, and the shipper could be left with

shipments that could not be shipped. In addition, either one or both parties may have volumes above the contract quantity of 100. Then it's more likely than not that this excess volume could not be handled.

These outcomes could be improved if this carrier (now referred to as "primary" carrier) moves to a carrier-owned and/or managed transportation marketplace. On a carrier's marketplace, this carrier may collaborate with another carrier, who may itself have its own contracted shipper. In situations where a primary carrier may have capacity less than the contract quantity with its shipper (now referred to as "primary" shipper), the primary carrier may utilize the unused capacity of the collaborating carrier to fulfill its obligations with its contracted primary shipper. In situations where the primary shipper defaults on the contract and does not offer adequate shipments to the primary carrier, the primary carrier may service the extra shipments that may be available with its collaborating carrier-shipper pair. Finally, in situations where the carrier may have capacity in excess of contract, the carrier may offer this capacity to its collaborating carrier. In these ways, the primary carrier may avoid defaulting on its contract with its contract/primary shipper. It may also realize increased capacity utilization in situations where either its primary shipper defaults on the contract and offers smaller shipments than the contract size or the primary carrier has capacity in excess of the contract quantity. Of course, realization of these benefits of collaboration depends on the actual shipment sizes and available carrier capacity between the collaborating carrier-shipper pair.

Shippers' marketplace, on the other hand, is geared to maximize the welfare for participating shippers. For this reason, a carrier participating on a shipper's marketplace may not have as many benefits as on a carrier's marketplace. However, there are still potential benefits for a carrier to participate on those marketplaces. For example, when a primary shipper does not have enough shipments to satisfy its contract size with its primary carrier and risks defaulting on the contract, then this primary shipper may be able to offer excess shipments from its collaborating shipper-carrier pair to avoid defaulting on the contract with its primary carrier. In this way, a carrier may sometimes indirectly benefit by participating on a shipper's marketplace.

SIMULATION MODEL

We used simulation modeling to investigate the HCT benefits to a motor carrier. Simulation has been widely used in the logistics and transportation literature. It is particularly useful to investigate "what-if" scenarios. In our situation, we want to investigate carrier performance for existing shipment data, if these shipments were managed on an electronic marketplace (EM) instead of a conventional transaction. Simulation modeling is ideal to investigate these types of questions. Figure 1 presents our simulation model.

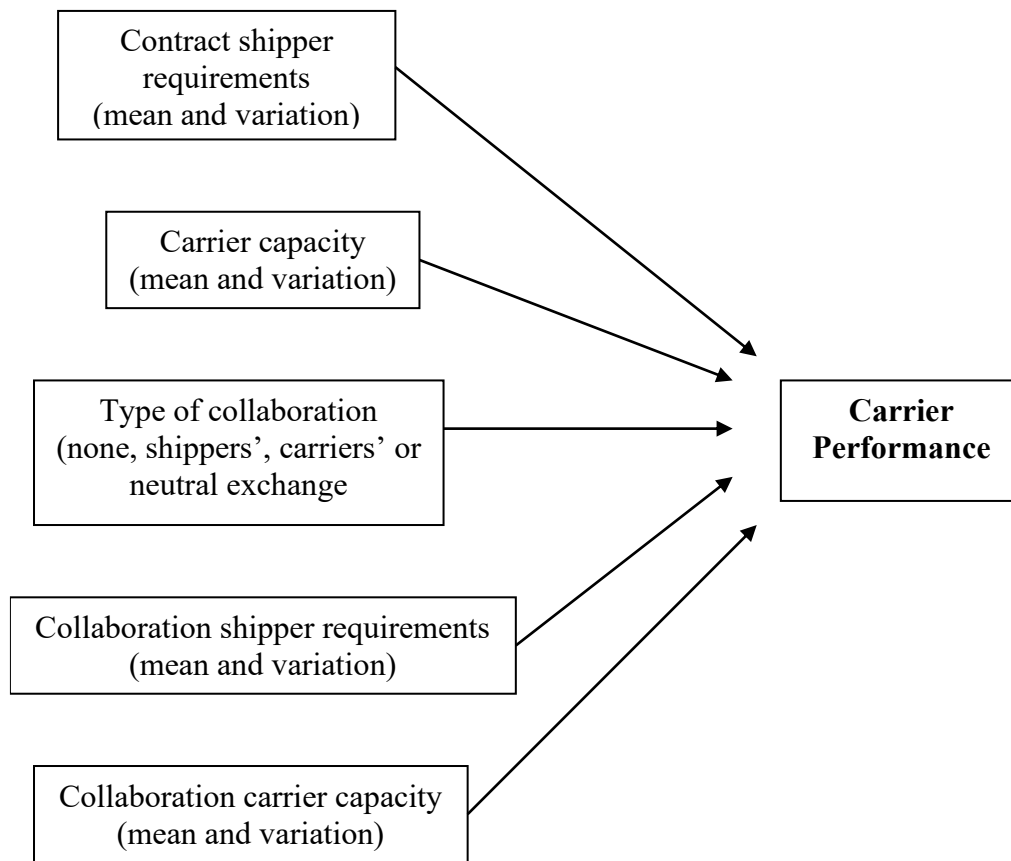


FIGURE 1. SIMULATION MODEL

Dependent Variable: Carrier performance

As we want to investigate the benefits of HCT on carrier performance, this forms our dependent variable. We measure carrier performance by its capacity utilization. It is a ratio defined as:

$$\text{Capacity Utilization} = (\text{filled capacity}) / (\text{total capacity})$$

Capacity utilization is important to carriers. This drives the revenue earned and profits realized. It is also important from environmental standpoint. Lower capacity utilization or empty trucks are not good for the environment. Capacity utilization is an important metric for carriers (e.g., Hernández et al., 2011)

Independent Variables

- Contract shipper's requirements: This construct measures the level or magnitude of the shipper's requirements and the variability of such requirements.
- Primary carrier's capacity: This construct measures the level or magnitude of the carrier's carrying capacity and the variability of this capacity.
- Collaborating partner's characteristics: A carrier may collaborate with either a shipper or another carrier, or with both. This construct measures the level or magnitude of the shipper's requirements or the carrier's capacity and the variability of these requirements and/or capacity.
- Type of collaboration: Shippers have four alternatives to manage their transportation. They may manage their transportation using the conventional method, or they may manage their transportation using one of the three alternatives: a shippers' EM, a carriers' EM or a neutral or third-party EM.

Our data comes from an American manufacturer of hardware, home appliances, and home improvement products. We collected a year's worth of truckload shipping data between various origin destination pairs (referred to as "lanes"). We received in excess of 25,000 shipment records that contained more than 13,000 lanes of truckload shipment data. The weight of shipments varied from a maximum of 45,000 lb to a minimum of 2,700 lb. The variation of weight may be explained by the diversity of products being shipped. We proceeded to identify a limited number of lanes to be included in our simulation model. We decided to only include those lanes that had in excess of 100 shipment records annually. This reduced the number of lanes to 41. We then fitted data on these lanes with standard normal probability distributions. Normal distributions are one of the most commonly used probability distributions in business simulation studies. We did some improvisations to use these distributions in our simulations. For example, normal distributions may generate negative values for shipping requirements or carrier capacities. This is not practical. Any negative value was truncated down to zero. Random distributions may also generate fractional values for truckload shipments. We rounded such values to their nearest integers. We aggregated shipping data on the selected 41 lanes at a weekly level. This generated 52 data points for every lane.

Our efforts in trying to fit standard normal probability distributions on those 52 data points for the selected 41 lanes resulted in a satisfactory fit for 10 lanes. The goodness of fit was evaluated using the chi-square test. Of the 10 lanes, we selected three to model shipper requirements and another three to model carrier capacities. We then used these probability distributions to model the characteristics of shippers and carriers, the parties involved in the transportation relationship. The important characteristics are the average shipping requirements and carrier capacities and their related variability. The maximum mean was 17.7 (corresponding to shipping requirements of approximately 17.7 truckload shipments per week) and the minimum was 2.4 (corresponding to shipping requirements of approximately 2.4 truckload shipments per week). We present the six lanes that were selected in Table 1.

TABLE 1. GOODNESS OF FIT STATISTICS OF NORMAL DISTRIBUTION FOR THE SELECTED LANES

Lane Number	Lane Miles	Number of truckloads per week			Fitted theoretical distribution			Chi-square value	
		Minimum	Maximum	Total	Mean	Standard deviation	Coefficient of variation	Sample	Critical
1	2324	0	6	125	2.4	1.33	0.55	1.3	6.25
2	2424	1	13	336	6.46	3	0.46	4.26	9.24
3	502	1	30	740	14.2	6.46	0.45	1.5	12.02
4	177	0	9	166	3.13	1.94	0.62	3.96	9.24
5	400	1	12	261	5.22	1.95	0.37	3.1	9.24
6	1404	2	38	937	17.7	6.89	0.39	7.18	12.02

For data analysis, we used the input analyzer provided within “Arena” simulation software. The chi-square values for all the lanes are well below the critical chi-square values for 90% confidence level. Given that, at the 90% confidence level, we do not have sufficient evidence to reject the null hypothesis that the fitted normal probability distributions are not a good representation of the data on these six lanes.

Simulation Model Variables and Values

Our primary interest is in investigating the benefits to carriers. However, any transportation transaction is initiated by the shipper. For this reason, in this section as we describe the variables, we start with the primary shipper.

1. Primary shipper’s shipping requirements: We use the fitted normal probability distributions to model the shipping requirements of the primary shipper. To capture the range of shipping requirements in our data, we chose two extreme values as representative of the lower and higher end of shipping requirements. We selected another lane that was approximately in the middle to represent medium shipping requirements. These lanes were chosen from the ten probability distributions obtained from the raw data. Table 1 shows six of those fitted theoretical normal distributions. The first three lanes are used to model the shipping requirements of the primary shipper. These values form the basis for the contract size between the primary carrier and its contract shipper. Since the mean truckload shipping requirements have to be integers, we round these shipping requirements in our data set to 2, 6 and 14 truckloads per week. These truckload shipping requirements were found to have a coefficient of variation in the range from 0.45 to 0.55. To represent this variation, we chose 0.5 for the coefficient of variation.
2. Primary carriers’ capacity availability. We found it difficult to obtain data from multiple organizations. For this reason, we assumed that the contract carrier’s carrying capacity has the same means and coefficient of variation as that of the primary shipper. Assuming the same means as that of primary shipper makes sense, as the contract carrier will commit the same amount of capacity asked by the primary shipper. Assuming the same coefficient of variation is a bit of a stretch, however, that was the best choice we could have made within the data limitations.
3. Shipping requirements of the collaborating shipper: We used the same data set to model the shipping requirements of the collaborating shipper. Ideally, we would have liked to have shipment records from a shipper that is operating on the same lanes as the primary shipper, and use that data in the simulation. We do think though that using the primary shippers shipping records, albeit on different lanes to model collaborating shipper requirements should be a reasonable accommodation to get around the problem of collecting data from multiple organizations. On high traffic lanes with large number of shippers with various levels of shipping requirements, it is conceivable that some of the shippers may very well be similar to the primary shipper in their shipping requirements (means and coefficients of variation). The probability distributions for the last three lanes in the table will be used as shipping

requirements of the collaborating shipper. These lanes have a mean shipping requirements of 3.13, 5.02 and 17.7. As we did with the primary shipper-carrier pair, the means of these theoretical distributions are used as a basis for the contract size between the collaborating shipper and its contract carrier. As these shipping requirements have to be integers, we round these numbers to 3, 5 and 8 truckloads of weekly shipments. The coefficient of variation of these shipping requirements were found to be in the range of 0.37 to 0.62. To capture this variation and to keep the difference between variations consistent at 0.2 (please note that the coefficient of variation for the primary shipper is 0.5), we chose 0.7 for the coefficient of variation. We also included 0.5 for the primary shipper's coefficient of variation to have a more diverse set of examples and variation in the data. We added a couple of coefficients of variation at 0.2 and 0.3. 0.2 is added to serve as a base level. This gives us four levels of variation for collaborating shipper requirements (0.2, 0.3, 0.5 and 0.7). To be consistent, we used the same four coefficients of variations for the primary shipper as well. These same coefficients of variation are used for the primary shipper-carrier pair.

4. Collaborating carriers' capacity availability: Similar to the primary carrier's capacity availability, using the same reasoning, we assume that the collaborating carrier sets its capacity at the same level as the shipping requirements of its contract shipper. We use the same coefficients of variation for the collaborating carrier as well.
5. Contract quantities. Using the same justification that collaborating shipper-carrier pair would set their contract quantity to reflect the shipping requirements of the shipper, we set the contract quantity between the primary-shipper carrier pair and a collaborating shipper-carrier pair to be equal to the shipping requirements of the respective shipper.

TABLE 2. SIMULATION MODEL PARAMETERS AND PARAMETER VALUES

Simulation Parameters	Parameter Levels
Primary shipper's shipping requirements, primary carrier's carrying capacity and the contract size between primary shipper-carrier pair	2, 6, 14
Coefficient of variation for primary shipper's shipping requirements	0.2, 0.3, 0.5, 0.7
Coefficient of variation for primary carrier's carrying capacity	0.2, 0.3, 0.5, 0.7
Collaborating shipper's shipping requirements, collaborating carrier's carrying capacity and the contract size between collaborating shipper-carrier pair	0.2, 0.3, 0.5, 0.7
Coefficient of variation for collaborating shipper's shipping requirements	0.2, 0.3, 0.5, 0.7
Coefficient of variation for collaborating carrier's carrying capacity	0.2, 0.3, 0.5, 0.7

Table 2 shows the experimental design of our simulation model with the dependent and independent variables and their values. The contract size between the primary shipper-carrier pair has three different values, as shown in Table 2. The low contract size is used as the base case. Two dummy variables labelled as high and medium contract size represent the other two values. Further, as shown in Table 2, the coefficients of variation for the shipping requirements and available capacity for the primary shipper-carrier pair has four different values. The low (0.2) value is used as the base case. Three dummy variables labelled as high, medium and low coefficients of variation represent the other three values. Other independent variables are also represented by dummy variables, the base case being the lower value for each independent variable.

We have two variables at three levels and four variables at four levels. That gives us $(3^2 * 4^4 = 9 * 16 = 2304)$ 2304 combinations.

To validate the model, we conducted fifty trial replications for the first combination of both, the primary and collaborating pair of shipper's requirements and carrier's capacity (mean 14 units, coefficient of variation 0.7). We used these results to find the required number of replications for obtaining 10% precision on carrier performance. The number of required observations was found to be 140. We replicated each parameter combination 300 times. We used the methodology to arrive at the required number of observations to achieve a predetermined level of precision in simulation results outlined in Law and Kelton (2000, pp. 511-515). We also validated the simulation model manually by computing the results for more than 1600 observations on the dependent variable and comparing these results to the ones obtained through the simulation program. As no discrepancies were found we concluded that the model is valid.

RESULTS AND DISCUSSION

Data analysis was conducted through ordinary least squares regression. Carriers have several options to manage transportation. These options form one set of independent variables. Carriers may manage their transportation through the conventional method. They may choose to collaborate using a shipper's marketplace, a carrier's marketplace or a neutral marketplace. Further, on each of these marketplaces, they have the option to collaborate with a shipper, a carrier or both. Given all these possibilities, carriers have a total of ten options to manage their transportation. We use nine dummy variables to represent those options. The conventional transportation method serves as the base case for regressions.

Table 3 presents regression results. Capacity utilization is used as the dependent variable for our regression analysis. Twenty-five dummy variables represent the independent variables in our model. These relate to the various collaboration options for a carrier, contract sizes between the primary and collaborating carrier-shipper pairs and the coefficients of variation for these shippers and carriers. The model is highly significant (at 0.001%) with an r square equal to 88.2%. All of our independent variables are statistically significant at 0.001% level.

The initial results are interesting. Carriers benefit the most from the carrier-owned or neutral (third party owned) marketplaces. These marketplaces aim to maximize the welfare for all the

participating entities, shippers and carriers alike. Order fulfillment on those marketplaces is found to be almost twice as much as on a shipper owned marketplace.

TABLE 3. CARRIER PERFORMANCE RESULTS: CAPACITY UTILIZATION

Variable		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
(Constant)		0.863	0.001		1146.298	0.000
Carriers' Exchange, collaborating with	Shipper	0.063	0.001	0.289	95.327	0.000
	Carrier	0.063	0.001	0.290	95.632	0.000
	Both	0.105	0.001	0.481	158.458	0.000
Neutral Exchange, collaborating with	Shipper	0.063	0.001	0.289	95.327	0.000
	Carrier	0.063	0.001	0.290	95.632	0.000
	Both	0.105	0.001	0.481	158.458	0.000
Shippers' Exchange, collaborating with	Shipper	0.035	0.001	0.163	53.603	0.000
	Carrier	0.036	0.001	0.164	53.909	0.000
	Both	0.058	0.001	0.268	88.246	0.000
Primary shipper-carrier contract size	Medium	-0.030	0.000	-0.217	-82.957	0.000
	High	-0.050	0.000	-0.359	-137.416	0.000
Primary carrier coefficient of variation	0.3	-0.015	0.000	-0.097	-34.955	0.000
	0.5	-0.039	0.000	-0.256	-92.268	0.000
	0.7	-0.056	0.000	-0.369	-132.959	0.000
Primary shipper coefficient of variation	0.3	-0.021	0.000	-0.139	-50.072	0.000
	0.5	-0.067	0.000	-0.445	-160.612	0.000
	0.7	-0.108	0.000	-0.714	-257.577	0.000
Collaborating partner's contract size	Medium	0.012	0.000	0.089	34.058	0.000
	High	0.035	0.000	0.255	97.629	0.000
Collaborating carrier coefficient of variation	0.3	0.002	0.000	0.014	5.088	0.000
	0.5	0.008	0.000	0.054	19.407	0.000
	0.7	0.011	0.000	0.075	27.105	0.000
Collaborating shipper coefficient of variation	0.3	0.003	0.000	0.018	6.384	0.000
	0.5	0.009	0.000	0.058	21.100	0.000
	0.7	0.013	0.000	0.085	30.828	0.000

Model is significant at 0.001% level. Model "F" value = 6888. Model R² value = 88.2%

The business rules of those marketplaces facilitate maximizing carrier performance. On these marketplaces, carriers are able to take a proactive role in increasing their capacity utilization. On the other hand, on a shipper owned marketplace, carriers only benefit as a byproduct of shippers' efforts to avoid defaulting on contracts they have with their carriers. They do not have an active role to be able to maximize their capacity utilization. Results also show that it is beneficial to collaborate with more than one partner on all the three types of marketplaces. Capacity utilization increases with the increase in the number of collaborating partners. However, there seems to be diminishing returns in collaborating with additional partners.

TABLE 4. COLLABORATION EFFECTS COMPARISON TABLE

Summary of the impact of various available collaboration options for the primary carrier on its capacity utilization (collaboration comparison table)

Collaboration options for the carrier									Carrier performance
C_C	C_S	C_B	N_C	N_S	N_B	S_C	S_S	S_B	Capacity Utilization
0	0	0	0	0	0	0	0	0	0.863
1	0	0	0	0	0	0	0	0	0.926
0	1	0	0	0	0	0	0	0	0.926
0	0	1	0	0	0	0	0	0	0.968
0	0	0	1	0	0	0	0	0	0.926
0	0	0	0	1	0	0	0	0	0.926
0	0	0	0	0	1	0	0	0	0.968
0	0	0	0	0	0	1	0	0	0.898
0	0	0	0	0	0	0	1	0	0.899
0	0	0	0	0	0	0	0	1	0.921

C_C/C_S/C_B = Carrier's marketplace, collaborating with a carrier/ shipper/both

N_C/N_S/N_B = Neutral marketplace, collaborating with a carrier/ shipper/both

S_C/S_S/S_B = Shipper's marketplace, collaborating with a carrier/ shipper/both

To get more clarity on this aspect, we created Table 4 to calculate the impact of the nine collaboration options on the performance of carriers. The first row of labels under the first larger column in the table titled "Collaboration options for the carrier" shows the various dummy variables indicating the 9 collaboration options. The second row indicates the base case of our regression equation where all the dummy variables are zero and the transportation is managed through conventional methods. The third row shows the impact of the carrier collaborating with another carrier on a carrier owned marketplace as indicated by a value of one for the dummy C_C.

The second larger column shows our dependent variable “carrier performance” measured through “capacity utilization.” This means that the third row of the larger column titled “carrier performance” gives the capacity utilization when a carrier manages its transportation on a carrier-owned marketplace and collaborates with another carrier. The value (0.926) is found by adding the regression constant (0.863) and the coefficient for the related dummy in the regression equation (0.063). All the other values are obtained in similar fashion. As could be observed in Table 4, on a carrier's marketplace, when a carrier collaborates with one partner, capacity utilization goes up to 92.6%. With another additional partner, the capacity utilization goes up to 96.8%. This shows that even though the capacity utilization increases with an increase in collaborating partners from one to two, the increase in capacity utilization is not as much as when the carrier collaborates with only one partner. This is a clear sign of decreasing marginal returns in capacity utilization.

Table 3 further reveals desirable characteristics of collaborating partners. It seems that capacity utilization shows more improvement for higher contact sizes between the collaborating shipper-carrier pair. This means that greater volumes between collaborating carrier and its contract shipper results in larger increases in capacity utilization. It may be that larger shipment volumes may create more slack to accommodate the primary carrier’s capacity requirements.

TABLE 5. COLLABORATING PARTNER CHARACTERISTICS EFFECTS TABLE

Effect of collaborating partner characteristics on shipper performance.

Contract Size		CV Carrier			CV Shipper			Carrier performance
Medium	High	Low	Medium	High	Low	Medium	High	Capacity Utilization
0	0	0	0	0	0	0	0	0.863
1	0	0	0	0	0	0	0	0.875
0	1	0	0	0	0	0	0	0.898
0	0	1	0	0	0	0	0	0.865
0	0	0	1	0	0	0	0	0.871
0	0	0	0	1	0	0	0	0.874
0	0	0	0	0	1	0	0	0.866
0	0	0	0	0	0	1	0	0.872
0	0	0	0	0	0	0	1	0.876

CV = Coefficient of Variation

Table 5 was created to more clearly bring out the impact of collaborating partner characteristics on carrier capacity utilization. This table has been similarly set up as in Table 4. The first three larger columns contain the dummy variables related to collaborating partner characteristics. The last column gives the performance outcome in terms of capacity utilization. As described earlier, the base capacity utilization is 86.3%. From the table, as the contract size between the collaborating shipper-carrier pair goes up and from low to medium, the capacity utilization increases to 87.5% from a base level of 86.3%. If the contract size is even higher indicated by the dummy for “High,”

capacity utilization further increases to 89.8%. It is thus clear that collaborating with bigger partners results in increased capacity utilization.

Looking at the results table (Table 3), it seems that the variability in volumes of both the collaborating shipper and its contract carrier have a positive impact on capacity utilization of the primary carrier. The impact of coefficient of variation as indicated by the related dummy variables (please refer to Table 5) results in an increase in capacity utilization from the base level of 86.3%. Capacity utilization increases at every higher level of variation of the volume of operation of collaborating shipper and carrier. This implies that if the collaborating partner has higher variation in their volume of operation (that is in the shipping requirements of the collaborating shipper and availability capacity of the collaborating carrier), that has a beneficial impact on the capacity utilization of the primary carrier. High variation between a collaborating partner and its contractual counterpart must result in a larger slack in terms of empty capacity or unserviced shipments. This slack must help the primary carrier to fill in that slack and increase its own capacity utilization.

Interestingly, all other things being equal, higher contract sizes between the primary carrier and its contract shipper seem to lead to lower rates of capacity utilization for the carrier. Please refer to the results table (Table 3). In essence, higher contractual capacity seems to lead to lower capacity utilization. It is conceivable that for a given coefficient of variation, higher contract sizes will create a larger mismatch between the primary carrier and its contract shipper. Assuming the same level of support from the collaborating partner, higher contract sizes between the carrier and its contract shipper will result in lower capacity utilization for the carrier. These impacts are quantified in Table 6. It could be observed that as the contract size between the primary carrier and its contract shipper increases from low to medium and then to high the capacity utilization drops from 86.3% to 83.3% and then to 81.3%.

TABLE 6. PRIMARY SHIPPER-CARRIER CHARACTERISTICS EFFECTS TABLE

Effects of primary shipper-carrier characteristics on carrier performance (primary pair table)

Contract Size		CV Carrier			CV Shipper			Carrier performance
Medium	High	Low	Medium	High	Low	Medium	High	Capacity Utilization
0	0	0	0	0	0	0	0	0.863
1	0	0	0	0	0	0	0	0.833
0	1	0	0	0	0	0	0	0.813
0	0	1	0	0	0	0	0	0.845
0	0	0	1	0	0	0	0	0.824
0	0	0	0	1	0	0	0	0.807
0	0	0	0	0	1	0	0	0.842
0	0	0	0	0	0	1	0	0.796
0	0	0	0	0	0	0	1	0.755

CV = Coefficient of Variation

Finally, from Table 3 it seems that variability in a primary carrier's available capacity and the shipping patterns of its shipping-shipper contract negatively impacts the primary carrier's capacity utilization. Looks like stable volumes at both primary carrier and its contract shipper are more favorable in terms of capacity utilization.

The numerical impacts are quantified in Table 6. As the variability in available capacity of the primary carrier increases from the base level to low, medium and high, the capacity utilization falls from 86.3% to 84.5%, 82.4% and 80.7% respectively. The respective impacts of increases in variability in shipping requirements of the shipper from the base level to low, medium and high on the primary carrier's capacity utilization are a decrease to 84.2%, 79.6% and 75.5%. This clearly shows that unpredictable shipping requirements or carrier capacity between the primary shipper-carrier pair has a negative impact on carrier performance.

CONCLUSIONS AND LIMITATIONS

Our results show that carriers benefit by participating in EMs and collaborating with other partners. Those benefits are maximum on carriers or third-party EMs. Though not in the best interest of the carriers, they still benefit by participating in shippers EMs. It may not be necessary to collaborate with a lot of partners. Most of the benefits may be obtained by collaborating with a handful of partners. Further, carriers gain more by collaborating with bigger partners. Partners that are not well established, in the sense of not having stable volumes, are actually better for the carrier.

Our study does have its limitations. We only have shipment data for shippers. It would have been interesting if the actual carrier data were available. Further, this study considers only a few shipping patterns. For better results, it will be useful to have data from several shippers/carriers.

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HUMILITY MEDIATING BETWEEN ACTIVE LISTENING AND TRUST-BUILDING ON EMPLOYEE ENGAGEMENT IN U.S. PRIVATE FINANCIAL ORGANIZATIONS

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ABSTRACT

The financial industry influences the global economy, making employee engagement vital for organizational success. This quantitative study examines the mediating role of servant leaders' humility in the relationships between active listening and employee engagement, and between trust-building and employee engagement, in U.S. private financial organizations. Grounded in servant leadership and social exchange theories, this study analyzed secondary data ($N = 190$) from U.S. institutions using simple random sampling. Mediation analysis revealed that humility partially mediates the relationships between active listening and employee engagement, and between trust-building and employee engagement. Both direct and indirect effects were statistically significant. Financial leaders and human resources management must implement active listening, trust-building, and humility to promote engagement. Implications for positive social change involve leveraging these characteristics to provide excellent customer service, foster community building, and achieve sustainable profitability in the U.S. private financial institutions.

INTRODUCTION

The financial industry, encompassing banks, insurance companies, and investment firms, is pivotal in influencing the national and global economy, yet its sustainability relies heavily on internal organizational performance. The U.S. dollar and the financial industry play a significant role in the global economy, supported by the U.S. economy's strength and size (Bertaut et al., 2025; Liu & Papa, 2022; Miranda-Agrippino & Rey, 2022). Furthermore, private financial institutions' performance is the primary indicator of financial organizational management and sustainability (Haryanti et al., 2025). Because finance facilitates economic operations (Pitt-Watson & Mann, 2022), organizations must effectively manage employees to increase profit. In this service-oriented industry, success relies on employee performance (Mo et al., 2024; Putri et al., 2023; Zeeshan et al., 2021). Consequently, enhancing employee engagement is a top priority; engaged employees

develop the positive attitudes necessary to build strong client relationships, driving customer satisfaction and overall organizational outcomes.

Leadership is the foundation of an organization's existence, and adopting positive leadership styles is essential for influencing the employee attitudes that drive financial outcomes. Leaders influence employees' work attitudes, performance, and the organization's reputation (Ansong et al., 2024; Minbashrazgah et al., 2021), and the literature confirms a connection between leadership styles and employee outcomes (Alam et al., 2023; Das & Pattanayak, 2023; Rabiul et al., 2022). Specifically, positive styles like servant leadership—which focus on empathy, support, and communal goals—are linked to positively influencing employee engagement (Çavuş & Karabörk, 2023; Liaqat et al., 2024; Olaniyi et al., 2023). While positive leadership is effective at increasing engagement in Western culture (Reuben, 2024; Yan et al., 2023), leaders must intentionally choose these styles to inspire employees to achieve organizational goals. Although ample scholarly articles exist on servant leadership and engagement in the financial industry, limited studies exist in the United States, accenting a geographical gap that requires further investigation.

BACKGROUND

Employee engagement is a multifaceted construct defined by a personal relationship, psychological commitment, and positive attitudes toward one's work and organization. Psychological commitment comprises three critical states—psychological safety, meaningfulness, and psychological availability—which directly influence work engagement (Beltrán-Martín et al., 2023). Fostering psychological safety allows employees to communicate ideas and concerns openly without fear of negative consequences, thereby creating a safe workspace that fuels work passion (Kyambade et al., 2024). Servant leaders play a pivotal role in cultivating this safety; by enabling employees to freely express creativity, leaders trigger a natural increase in engagement. This psychological commitment translates directly into tangible organizational benefits and performance metrics.

Organizations must strive to achieve high employee engagement because it serves as a critical driver for positive organizational outcomes and operational success. Data indicates that engaged employees contribute to significant increases—10% in customer loyalty, 13% in productivity, and 23% in profitability—while reducing negative metrics such as absenteeism by 78% and turnover by 21% (Gallup, 2024). These benefits stem from the quality of employees' discretionary work efforts; engaged employees feel valued and, as a result, go above and beyond their required responsibilities to improve service quality. While engagement is vital across all sectors, its significance is amplified in service-oriented industries where human capital is the primary product.

The financial industry is inherently service-oriented, meaning employees are the primary interface with clients and the key drivers of competitive advantage. Human capital is the driver of performance in finance, and organizations must prioritize employee well-being to secure positive outcomes (Saleh et al., 2022). To provide excellent service, employees need effective soft skills, not just operational skills, to interact effectively with customers (Lee & Yoo, 2023; Pahuja et al., 2024). In this context, leaders act as catalysts for performance (Amhana & Thomas, 2024); when

leaders foster a positive environment, employees respond with loyalty and high-quality service. Given this reliance on soft skills, the specific leadership style adopted by financial managers becomes a determinant of success, pointing toward servant leadership.

Servant leadership prioritizes employees' well-being and development, making it a superior framework for generating engagement compared to other leadership styles. Empirical studies illustrate significant differences in outcomes between servant leadership and other styles (Limbong & Saragih, 2023), with Li, Sun et al. (2021) finding that servant leadership had the strongest association with engagement. While servant leadership encompasses qualities of ethical and empowering leadership, it uniquely emphasizes serving followers first using compassion, empathy, and persuasion (Martinez & Leija, 2023). The effectiveness of this leadership style relies on specific behavioral characteristics, particularly the interplay between active listening and trust.

Servant leaders leverage active listening to demonstrate respect and build the trust necessary for a harmonious workplace. Jonsdottir and Kristinsson (2020) found a positive correlation between active-empathetic listening and engagement, as this process involves the listener prioritizing the speaker's needs (Kainde & Mandagi, 2023). Grounded in social exchange theory, this interaction creates a reciprocity loop: when leaders demonstrate integrity and care through listening, they foster a psychological state in which vulnerability is accepted (Nemati et al., 2022). However, the mechanism that likely bridges the gap between these leadership behaviors and ultimate employee engagement is the leader's humility.

Servant leaders' humility serves as a vital mechanism for creating positive outcomes, yet it remains relatively unstudied in the context of U.S. private financial organizations. Leaders without humility are close-minded and hinder creativity due to power distance (He et al., 2023), whereas humble leaders prioritize employees' achievements over their own (Krumrei-Mancuso & Rowatt, 2023). The connection between humility and servant leadership is inevitable; through humility, leaders create the psychological safety required for engagement. Therefore, this research paper extends Sung's (2025) study by examining the specific mediating role of servant leaders' humility in the relationship between active listening, trust-building, and employee engagement.

PROBLEM

The social problem is that ineffective leadership characteristics are impairing employee engagement, a critical factor for driving organizational performance and competitive advantage. Academic literature indicates that specific leadership behaviors are driving this disconnection (Cakiroglu & Unver, 2024; Kumara & Senguptab, 2023), leading to severe economic consequences. Gallup (2025) reported that declining engagement cost the global economy \$438 billion last year, with U.S. engagement dropping from 32% to 31%. Furthermore, 69% of U.S. employees are "quiet quitting"—psychologically disconnecting and actively seeking new jobs (Gallup, 2025). This trend is largely top-down; manager disengagement has risen to 73%, and because engagement is contagious, disengaged leaders foster disconnected teams who work without passion or energy. Therefore, identifying leadership behaviors that can reverse this psychological disconnection is essential for sustaining organizational productivity.

The specific problem is that it is unknown if servant leaders' humility mediates the relationships between active listening and employee engagement, and between trust-building and employee engagement, in U.S. private financial organizations. While researchers have investigated servant leadership extensively in sectors such as healthcare, academia, and religion, or in international contexts (Al-Asfour et al., 2022; Palabiyik et al., 2023; Zeeshan et al., 2021), there is a distinct lack of literature addressing this specific combination of variables in the U.S. financial sector (Akbal & Karabulut, 2024; Zanabazar et al., 2023). By extending Sung's (2025) work, this study isolates humility as a potential bridging mechanism that explains how active listening and trust-building translate into higher engagement. Addressing this gap contributes vital data to the management literature, offering specific strategies for U.S. financial leaders to combat the engagement crisis.

PURPOSE

The purpose of this quantitative study is to analyze the mediating role of servant leaders' humility between active listening and employee engagement, and trust-building and employee engagement in U.S. private financial organizations. The two independent variables are servant leaders' active listening and trust-building; the dependent variable is employee engagement; and the mediator variable is humility. This study identified specific servant leader characteristics that influenced employee engagement, while humility mediated the promotion of customer satisfaction and loyalty in private financial organizations, using a cross-sectional survey.

RQ1: What is the mediating role of servant leaders' humility in the relationship between active listening and employee engagement in U.S. private financial organizations?

H₀₁1: Servant leaders' active listening is not positively related to employee engagement in U.S. private financial organizations.

H_{a1}1: Servant leaders' active listening is positively related to employee engagement in U.S. private financial organizations.

H₀₁2: Servant leaders' active listening is not positively related to humility.

H_{a1}2: Servant leaders' active listening is positively related to humility.

H₀₁3: Servant leaders' humility is not positively related to employee engagement in U.S. private financial organizations.

H_{a1}3: Servant leaders' humility is positively related to employee engagement in U.S. private financial organizations.

H₀₁4: Servant leaders' humility does not mediate the relationship between active listening and employee engagement.

H_{a14}: Servant leaders' humility mediates the relationship between active listening and employee engagement.

RQ2: What is the mediating role of servant leaders' humility in the relationship between trust-building and employee engagement in U.S. private financial organizations?

H_{o21}: Servant leaders' trust-building is not positively related to employee engagement in U.S. private financial organizations.

H_{a21}: Servant leaders' trust-building is positively related to employee engagement in U.S. private financial organizations.

H_{o22}: Servant leaders' trust-building is not positively related to humility.

H_{a22}: Servant leaders' trust-building is positively related to humility.

H_{o23}: Servant leaders' humility is not positively related to employee engagement in U.S. private financial organizations.

H_{a23}: Servant leaders' humility is positively related to employee engagement in U.S. private financial organizations.

H_{o24}: Servant leaders' humility does not mediate the relationship between trust building and employee engagement.

H_{a24}: Servant leaders' humility mediates the relationship between trust building and employee engagement.

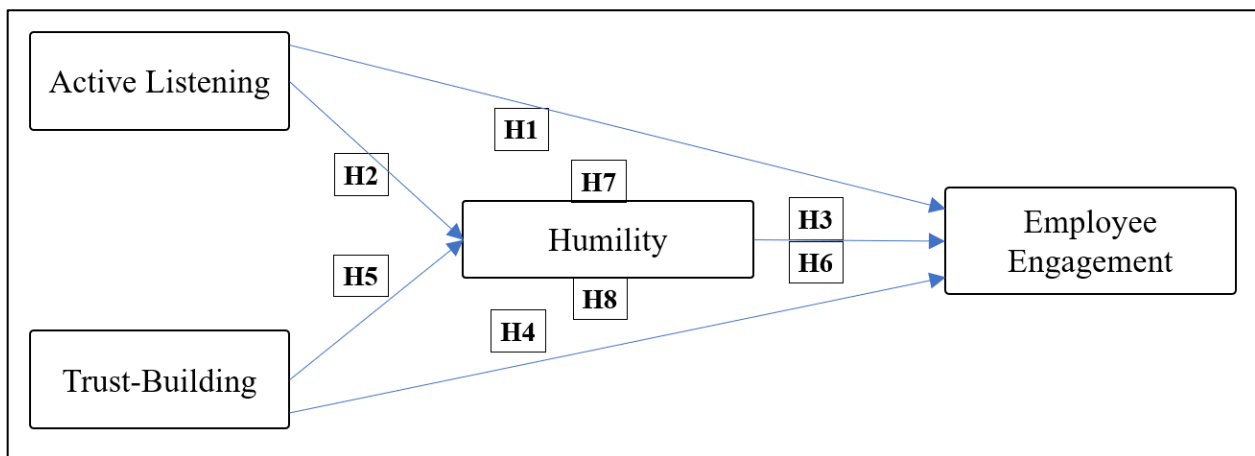


FIGURE 1. PROPOSED RESEARCH MODEL

THEORETICAL FOUNDATION

Greenleaf's (1977) servant leadership theory provides the primary grounding for this study, as it defines the specific behaviors—active listening, humility, and trust-building—that are necessary to cultivate human capital in financial organizations. Greenleaf coined the term to describe leaders who prioritize followers' needs and growth ahead of their own, a framework later expanded by Spears (2010), who identified listening as the first of ten critical characteristics, and Patterson (2003), who classified humility and trust as virtuous constructs. This theory is particularly suitable for this study because financial organizations depend heavily on employees' knowledge and enthusiasm to maintain successful customer relationships. By applying active listening to gently persuade and humility to empower others (Sousa & van Dierendonck, 2021), servant leaders create a psychological environment that encourages employees to excel. However, while servant leadership defines the actions of the leader, it is the reciprocal nature of these actions that drives the reaction of employee engagement.

Blau's (1964) social exchange theory complements servant leadership by explaining the mechanism of reciprocity: how leader behaviors translate into employee engagement. Blau posited that dyadic relationships are created through reciprocity, a concept supported by recent research indicating that exchange relationships advance when organizations demonstrate genuine care for employees (Jiwen Song et al., 2024; Rahal & Farmanesh, 2022). The rationale for using social exchange theory in this study is grounded in the reciprocity doctrine. According to this principle, when servant leaders demonstrate humility and build trust, employees feel obligated to reciprocate with loyalty, commitment, and increased work engagement (Demeke et al., 2024; Zhou et al., 2022). This interdependent process creates a cycle where respect is given in return for respect, solidifying the bond between leader and follower (Dami et al., 2022). Together, these theories offer a comprehensive understanding for organizations seeking to enhance work engagement through specific leadership characteristics and motivational elements.

SIGNIFICANCE OF THE STUDY

This study is significant because it underscores the need for organizations to emphasize employee engagement. The Gallup (2025) survey found that 79% of employees worldwide and 69% in the United States are disengaged, up 2% from last year. For instance, to replace one employee with an average annual salary of \$50,000 would cost about \$100,000. When an organization multiplies \$100,000 by 100 employees, the organization will spend \$10,000,000 (McFeely & Wigert, 2019). There has been extensive literature on the benefits of employee engagement in organizations. A vast amount of past literature exists on employee engagement and servant leaders' characteristics, including empathy, humility, altruism, benevolence, ethicality, authenticity, serving others, and emotional intelligence (Li, Xue, & Liu, 2021; Meskelis & Whittington, 2020). Empathy is the epitome of servant leadership, and servant leaders use it when listening to their followers actively (Elche et al., 2020). There was limited literature on servant leaders' humility mediating between active listening and trust-building as independent variables on employee engagement in U.S. private financial organizations. The findings of this study contribute to filling a gap in the field of

leadership and management by providing more informed knowledge and understanding of ways to increase employee engagement.

Significance to Theory

This study contributes to the theoretical advancement of Greenleaf's (1977) servant leadership theory and social exchange theory by explicating how specific leadership behaviors, namely humility, active listening, and trust-building, interact to drive employee engagement within the U.S. private financial sector. Greenleaf defined servant leadership through characteristics such as empathy, stewardship, and placing followers' needs first (Spears, 2010; Sun et al., 2023). Social exchange theory explains the mechanism of this influence through the reciprocity doctrine, where leaders' genuine care prompts followers to reciprocate with loyalty and engagement (Gouldner, 1960). By integrating these frameworks, this research validates the positive connection between these theories and engagement (Bai et al., 2023); however, it uniquely extends them by isolating the mediating role of humility, a variable previously underrepresented in this context. Consequently, these findings offer a refined theoretical model for understanding how financial leaders can leverage fairness and justice to foster the deep dyadic relationships necessary for sustained organizational success.

Significance to Practice

This research offers several practical implications, especially within U.S. private financial organizations. Servant leaders who practice humility, active listening, and trust-building demonstrate sincere concern and care for their followers. The findings' implications may help support the professional practice of applying the three servant leadership characteristics to increase employee engagement within the private financial industry and the organizational leadership and management fields. Employees of financial organizations, especially in insurance institutions, typically require state and federal licenses to sell health and life insurance and security products, such as stocks, mutual funds, and variable life insurance. The findings may also have practical implications, revealing how to enforce those three servant leaders' characteristics among financial organizations' employees to enhance and maintain ethical conduct with their clients.

Significance to Social Change

The potential for positive social change lies in the widespread application of servant leaders' humility, active listening, and trust-building, which fosters not only organizational excellence but also broader community well-being. Research confirms that engaged employees are pivotal for securing customer satisfaction and loyalty in service industries (Mukelabai & Mulungu, 2024; Pahuja et al., 2024). Furthermore, this study's results indicated that humility partially mediates the positive influence of listening and trust on such engagement. When financial leaders implement

these characteristics, they establish a psychologically safe environment where employees thrive (Lv et al., 2022); subsequently, these satisfied employees apply the same virtues of empathy and respect in their client interactions to provide exceptional financial services. As a result, clients reciprocate this trust and loyalty, strengthening the bond between financial institutions and the public, thereby sustaining a continuous cycle of community building and social growth.

METHODS

This quantitative study employed a cross-sectional correlational design to examine the mediating role of servant leaders' humility in the relationship between the independent variables (active listening and trust-building) and the dependent variable (employee engagement). Correlational research focuses on collecting data to understand relationships and explain phenomena using statistics without manipulating variables (Frankfort-Nachmias et al., 2024). Consequently, this design measures the variables' values to determine statistical association, significance, and effect sizes rather than inferring causality. By analyzing data at a single point in time, this approach effectively captures the current state of leadership dynamics. To ensure these dynamics were representative, the study relied on rigorous sampling from a specific population.

The study analyzed secondary data from Sung's (2025) research, which employed simple random sampling of employees aged 18 and older in medium-to-large U.S. private financial organizations to ensure validity. Data collection used four established instruments: Liden et al.'s (2015) SL-7 for servant leadership; Dennis and Bocarnea's (2005) SLAI for trust-building and humility; Brownell's (2008) HURIER model for active listening; and Schaufeli et al.'s (2006) UWES-9 for employee engagement. Simple random sampling was crucial to minimize researcher bias and enhance generalizability (López, 2023). Furthermore, all instruments demonstrated high reliability with Cronbach's alpha coefficients ranging from .884 to .968, surpassing the conventional threshold of .70 (Forero, 2023). This robust, validated dataset provided the necessary foundation for advanced statistical processing.

Data analysis was conducted using regression analysis in IBM SPSS version 29 and PROCESS v4.2 by Andrew F. Hayes for mediation analysis. This method was specifically chosen to test the framework involving two independent variables (active listening and trust-building), one mediator (humility), and one dependent variable (employee engagement). Mediation regression analysis was appropriate not only for assessing statistical significance but also for isolating the specific indirect effects of the mediator. The output from these statistical tests directly addressed the research hypotheses, determining the nature of the relationships between the leader's behaviors and employee engagement.

Procedures for Recruitment and Participation

There was no recruitment process because the data were secondary. The participants' demographic information was from the private financial industry in the United States. Other factors included

age, level of education, employment status (full-time or part-time), gender, and work tenure in the current position (Sung, 2025). Based on the mediation regression analysis using G*Power software, version 3.1.9.7, calculation, the minimum sample size was 107. The total number of participants who completed the survey was 190, a 178% response rate.

Data Analysis Plan and Data Collection

Due to the nature of being secondary data, no surveys were performed. This study had two independent variables, one mediator variable, and one dependent variable. Mediation regression analysis was appropriate in establishing the relationships between the independent, mediator, and dependent variables. Mediation regression analysis is a statistical method that estimates the effect of a single independent variable on a dependent variable through a single mediator variable. This study's data analysis plan incorporated IBM SPSS statistical software and PROCESS v4.2 by Andrew F. Hayes' mediation regression analysis to provide correlational statistics among two independent variables, one mediator variable, and one dependent variable. IBM SPSS is a widely used predictive analytics software that assists decision-making processes across various industries and benefits organizations by increasing employee outcomes and customer satisfaction in the U.S. private financial institutions. The total number of survey questions was 52: (a) seven questions for SL-7, (b) six questions for humility from SLAI, (c) six questions for trust-building from SLAI, (d) 24 questions for the HURIER listening model, and (e) nine questions for UWES-9.

RESULTS

This section presents statistical analysis findings using IBM SPSS and PROCESS v4.2 based on Andrew F. Hayes' mediation regression analysis to examine the mediating role of servant leaders' humility between servant leaders' active listening and trust-building on employee engagement. Variable names were shortened by abbreviating humility to HM, active listening to AL, trust-building to TB, and employee engagement to EE. After removing extreme outliers (Case Numbers 55, 62, and 97), using the command `$CASENUM ~=`, the total sample size was $N = 187$. Hayes' (2012) PROCESS v4.2, mediation regression analysis, was used to obtain the total, direct, and indirect effects. PROCESS v4.2 is a free SPSS computational tool for analyzing the influence of a mediator variable on the relationship between the independent and dependent variables (Hayes, 2012). PROCESS provides a bird's-eye view of the mediation and moderation analysis, including R -squared values, F statistics, t values, p values, unstandardized regression coefficients (B), and standardized coefficients (β).

Mediation Assumptions

The mediation regression analysis follows all the assumptions for regression analysis. Based on Sung's (2025) study, all the assumptions for multiple regression analysis have been met. Mediation

analysis follows four assumptions. The first assumption is that all variables (dependent, independent, and mediator) must be continuous (Fein et al., 2022). The variables for this study are continuous, thus meeting the first assumption. The second assumption is linearity between variables, which a scatterplot can verify. A scatterplot shows a random pattern without any odd funnel shapes, indicating that linearity exists between the variables and thus meeting the linearity assumption. The third assumption requires that multicollinearity cannot exist, and the variance inflation factor can detect and measure the collinearity in a multiple regression model. VIF of 1 – 5 is considered moderately correlated, and 5 – 10 refers to highly correlated (Fein et al., 2022). Although correlation coefficients between variables were above .800, VIF values were below 5 (HM = 4.882, AL = 4.235, and TB = 4.460), avoiding high multicollinearity and meeting the multicollinearity assumption. The fourth assumption is normality; based on the histograms in SPSS, the distributions were approximately normal, thus meeting the normality assumption.

Research Question 1

The first research question was: What is the mediating role of servant leaders’ humility in the relationship between active listening and employee engagement in U.S. private financial organizations? To address RQ1, the goal was to determine whether servant leaders’ active listening was positively related to employee engagement and humility, and whether humility was positively related to employee engagement. Additionally, the study examined whether servant leaders’ humility mediated the relationship between active listening and employee engagement. RQ1 has four hypotheses. Table 1 shows $p < .05$ for all pathways, indicating that the alternative hypotheses (H1₁, H1₂, and H1₃) were supported and the null hypotheses were rejected.

TABLE 1. MEDIATION ANALYSIS SUMMARY FOR ACTIVE LISTENING

Relationship	<i>B</i>	β	<i>t</i> - statistics	<i>R</i> ²	<i>p</i> -value	Hypotheses Results
H1 ₁ : AL→EE	1.035	.709	13.6716	.503	.000	Supported
H1 ₂ : AL→HM	1.389	.850	21.920	.722	.000	Supported
H1 ₃ : HM→EE	.182	.659	2.087	.434	.038	Supported

Research Question 2

The second research question was: What is the mediating role of servant leaders’ humility in the relationship between trust-building and employee engagement in U.S. private financial organizations? To address RQ2, the goal was to determine whether servant leaders’ trust-building was positively related to employee engagement and humility; whether humility was positively related to employee engagement; and whether servant leaders’ humility mediated the relationship between servant leaders’ trust-building and employee engagement. RQ2 also has four hypotheses.

Table 2 shows $p < .05$ for all pathways, indicating that the alternative hypotheses (H2₁, H2₂, and H2₃) were supported and the null hypotheses were rejected.

TABLE 2. MEDIATION ANALYSIS SUMMARY FOR TRUST-BUILDING

Relationship	<i>B</i>	β	<i>t</i> - statistics	<i>R</i> ²	<i>p</i> -value	Hypotheses Results
H2 ₁ : TB→EE	.669	.677	4.640	.459	.000	Supported
H2 ₂ : TB→HM	.948	.858	22.714	.736	.000	Supported
H2 ₃ : HM→EE	.2632	.659	2.853	.434	.005	Supported

The study assessed the mediating role of servant leaders' humility on the relationship between active listening and employee engagement in U.S. private financial organizations. The results revealed a statistically significant indirect effect of active listening on employee engagement ($b = .253$, $t = 5.500$), 95% CI [.022, .484], supporting H1₄. In addition, the direct effect of active listening on employee engagement, in the presence of the mediator, was statistically significant ($b = .783$, $p < .001$), with humility partially mediating the relationship. The results further revealed a statistically significant indirect effect of trust-building on employee engagement ($b = .250$, $t = 4.109$), 95% CI [.081, .448], supporting H2₄. The direct effect of trust-building on employee engagement in the presence of the mediator was also statistically significant ($b = .419$, $p < .001$), and humility partially mediated this relationship. Humility partially mediated between servant leaders' active listening and employee engagement, and trust-building and employee engagement, because the direct effect (C') of active listening and trust-building was positively related to employee engagement (see Research With Fawad, 2022). Table 3 presents the mediating role of servant leaders' humility on the relationship between active listening and trust-building on employee engagement.

TABLE 3. MEDIATION ANALYSIS SUMMARY

Relationship	Total Effect	Direct Effect	Indirect Effect	Confidence Interval		<i>t</i> - statistics	Results
				Lower Bound	Upper Bound		
H1 ₄ : AL→HM→EE	1.035 (.000)	.783 (.000)	.253	.022	.484	5.500	Partial Mediation
H2 ₄ : TB→HM→EE	.669 (.000)	.419 (.001)	.250	.081	.448	4.109	Partial Mediation

Summary

This study used secondary data from Sung's (2025) study "Servant Leaders' Humility, Active Listening, and Trust-Building for Employee Engagement in U.S. Private Financial Organizations." The total sample was $N = 190$, leading to an 178% response rate; however, after removing three extreme outliers, the usable sample was $N = 187$. All alternative hypotheses for RQ1 and RQ2 were supported ($p < .05$). For alternative hypotheses, H1₄ and H2₄, servant leaders' humility partially mediated the relationships between active listening and employee engagement, and trust-building and employee engagement, because the direct effect for active listening and trust-building was positively related to employee engagement.

DISCUSSION

The financial industry is critically responsible for global economic growth, yet its success relies heavily on the performance of employees in a service-oriented environment. Employee engagement plays a pivotal role in benefiting both individual and organizational performance (Dzogbenuku et al., 2024; Mo et al., 2024). This study expanded on Sung's (2025) research, providing evidence that this engagement can be significantly increased by implementing servant leaders' active listening, trust-building, and humility. Organizations must prioritize these strategies because engaged employees provide the outstanding customer service necessary for survival; when customers receive satisfactory service, they reciprocate with trust and loyalty, driving organizational profitability. Consequently, financial leaders must move beyond general management to specific behavioral characteristics, specifically active listening, trust-building, and humility, to secure these outcomes.

This study confirmed that humility is not merely a passive trait but a critical mechanism that mediates the relationship between leadership behaviors and employee engagement. Statistical analysis revealed that active listening has a strong positive effect on humility ($\beta = .850, p < .001$), and humility partially mediates the relationship between active listening and engagement ($b = .253$). Similarly, humility mediates the link between trust-building and engagement ($b = .250$), supporting the view that humble communication fosters trust (Soderberg & Romney, 2022). Grounded in social exchange theory, these findings suggest that humility validates the speaker, creating the psychological safety required for reciprocity (Bai et al., 2023; Lehmann et al., 2023). When leaders avoid portraying superiority (Michalec et al., 2024), they reinforce the dyadic relationship, allowing listening and trust to translate effectively into work passion. Thus, humility acts as the fundamental virtue that binds active listening and trust-building to sustainable employee engagement.

Limitations of the Study

This study presented three limitations: (a) a non-experimental study, (b) self-reported surveys, and

(c) highly correlated predictors. The first limitation is the study's design, which is non-experimental, correlational, and cross-sectional. A non-experimental study cannot make causal inferences because the survey is administered at a single point in time. One of the most common biases in self-reported surveys is response bias, which is the second limitation. Response bias occurs due to self-assessment, and many occurrences may hinder respondents' decisions (Rosenman et al., 2011). For instance, depending on employees' mood at the time of the survey, their responses may change, creating response bias. The quantitative study is useful for analyzing relationships among variables; however, it lacks a comprehensive description of the phenomenon and the reasons behind respondents' selections. A qualitative or mixed-methods approach involving a field study would yield extensive findings for establishing causality. Also, interviews or focus groups would offset the limitation of the self-reported survey.

Independent and mediation variables were correlated, as the correlation matrix showed active listening and humility ($r = .850$), trust-building and humility ($r = .858$), and active listening and trust-building ($r = .834$). However, VIF values were all below 5, indicating no multicollinearity. Increasing the sample size and conducting the study in different states and countries may lower the values. Additionally, conducting the same survey in different regions establishes the generalizability of the research findings.

Implications

This quantitative, correlational study successfully confirmed the mediating role of humility in the relationship between active listening/trust-building and employee engagement; however, future research should expand methods to fully understand the mechanisms underlying these relationships. While the current results supported all hypotheses (H1₂, H1₁, H2₂, H2₁) and confirmed partial mediation, quantitative designs are limited to measuring frequency, extent, and statistical association (Frankfort-Nachmias et al., 2024). To understand the rationale behind these correlations and reveal the specific meanings participants ascribe to leadership behaviors, future studies should adopt qualitative or mixed-methods approaches. A mixed-methods design could first explore employees' perceptions of impactful characteristics (qualitative) and then test those specific relationships (quantitative) across different industries to improve generalizability. Expanding the methodology in this way would deepen the understanding of the theoretical mechanisms at play, particularly social exchange theory.

The findings reinforce social exchange theory as a critical framework for management, demonstrating that leaders who invest in employees through specific servant behaviors trigger a reciprocal obligation for engagement. Numerous scholars (Birgisdóttir et al., 2024; Simbula et al., 2023) affirmed that when leaders treat employees with respect and invest in their development, employees reciprocate with trust and loyalty (Blau, 1964). This study confirms that servant leaders' active listening, trust-building, and humility act as the investment that triggers this intrinsic motivation. In practice, this notion suggests that financial industry leaders and HR management must operationalize these behaviors to address the intense pressure of work in financial services (Yoo et al., 2023). Because frontline employees determine customer loyalty, implementing these specific leadership traits is not just a theoretical ideal but a strategic necessity.

for organizational productivity (Cai et al., 2024). These practical improvements within the organization naturally extend outward, influencing the broader social fabric.

The potential impact of these findings extends beyond organizational profitability to positive social change by fostering unity and trust within the broader community. Active listening is known to improve well-being and trust (Kluger & Itzchakov, 2022), creating strong interpersonal bonds. When organizational leaders model humility, listening, and trust, they set a standard that employees mirror in their client interactions. This standard establishes a chain reaction: employees provide empathetic financial services, and clients reciprocate with loyalty, thereby strengthening the relationship between the financial institution and the community. Applying these techniques creates a cycle of empathy and respect that transcends the workplace, contributing to a healthier, more connected society.

CONCLUSIONS

Leadership is a collaborative responsibility rather than a privilege, and effective leaders serve as the primary catalyst for employee engagement and organizational success. Well-rounded leaders manage themselves through mindfulness and discipline, recognizing that their emotions directly influence followers' emotions and work passion. In the financial industry specifically, leaders who prioritize well-being and nurture talent cultivate the loyalty necessary for exceptional customer service. When leaders provide support and empowerment, they create a shared purpose that stands in contrast to the discontinuity caused by ineffective, disengaged management. By connecting leadership directly to employee growth, financial institutions can foster a workforce that is not just present but intensely engaged in providing quality service. To achieve this, organizations must move beyond traditional top-down models and embrace employee-centered frameworks, specifically servant leadership.

This study confirmed that servant leadership is a vital mechanism for U.S. private financial organizations, with humility playing a critical mediating role between leader behaviors and employee engagement. Grounded in social exchange theory, the findings demonstrated positive relationships between active listening, trust-building, and engagement, while revealing that humility partially mediates these effects. Unlike traditional leadership, which prioritizes organizational goals, servant leadership prioritizes employee needs. Humility serves as the bridge here, forcing the leader to focus entirely on the other, making employees feel at ease and valued. Consequently, human resource management and organizational leaders must actively cultivate active listening, trust-building, and humility to sustain the continuous improvement of employee engagement and organizational profitability.

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