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## Article

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# The effect of capital structure on performance: empirical evidence from manufacturing companies in Ethiopia

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## ABSTRACT

The aim of the study was to investigate the effect of capital structure as measured by total debt ratio (TOD) and long term debt ratio (LTD), on operating performance and financial performance as measured by Net Operating Profitability (NOP) and Return on Assets (ROA), respectively. Four hundred and twenty-five panel observations were obtained using the financial statements of a sample of 85 manufacturing enterprises for the years 2017 to 2021. In addition to descriptive statistics of mean, standard deviation, minimum, and maximum value, Pearson's correlation analysis, robusted random effect, and two step system Generalized Moment Method (GMM) model were employed to analyse the data. The result revealed that each of TOD and LTD have negative and significant effects on NOP and ROA which supports the pecking order theory, whereas control variables of FATR and FS have positive and significant effect on NOP and ROA at conventional significance level. To improve performance and maintain profitability, financial managers are advised to implement sound capital structure policies and lower the level of debt.

## PUBLIC INTEREST STATEMENT

The purpose of the study was to establish relationship and examine the effect of capital structure on the performance of Ethiopian Manufacturing Companies. This study is relevant and has contributed to four stakeholders. First, policymakers can use as an intervention mechanism for financing requirement. Second, financial managers of manufacturing companies can consider the debt equity mix while setting financing policy that enhances performance. Third, researchers can consider as special point of reference for further research. Finally, to the academia, the study has obtained evidence supporting the pecking order theory of capital structure that explains the arena of manufacturing companies in Ethiopia.

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## SUBJECTS

Corporate finance; economics; economic theory and philosophy; finance; business; management and accounting

## 1. Introduction

As far as there is a decision to start new business or to expand the existing business, the need for finance is inevitable, and thus, firms concern how to secure the financial requirements so as to make investment and maximize the wealth of shareholders (Ayalew, 2021; Yaregal, 2007). There are ideas regarding an ideal debt equity mix and capital structure to employ that would optimize share prices and, ultimately, a company's worth. In 1958, Modigliani and Miller made a ground-breaking contribution that gave rise to other theories of the capital structure.

In a perfect capital market condition, there are no costs related to bankruptcy, taxes, and transactions, and hence the value of a firm is not related to capital structure supporting the idea that capital structure is irrelevant. Since then, puzzle of capital structure related to the firms' financing decision continue with other emerging theories and empirical studies that examined the effect of capital structure on the performance of firms. Such theory of the capital structure is vital reference theory in financing policy of firms as the theories imply whether optimal capital structure exists which is one of the most critical, complex, and controversial agenda in corporate finance literature. Despite the contradicting results,

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numerous studies have been done to gather empirical information concerning the influence of capital structure on performances in addition to theoretical advancement.

In relation to financing practice, Ethiopia lacks a capital market from which viable investments could have been financed, which in turn affects the capital structure of firms and, in turn, their performance. This is in contrast to the research environments of studies in many developed and few emerging nations. Numerous studies in the area employed restricted proxies to gauge financing decision and profitability. The current study was driven to find out more about the relationship between capital structure and performance in the context of Ethiopian manufacturing companies because there are also conflicting results from empirical studies.

Many studies in the area have been conducted in the financial sector including the study of Dabi et al. (2023), who studies the effect of capital structure on performance and sustainability of Micro Finance Institutions of Gahma. With reference to empirical studies in Ethiopia, majority of the empirical studies in Ethiopia are limited to collect evidence from banks with small sample size and employed OLS regression like in the study of Ayalew (2021) and construction companies as studied by Meyad and Kefiyalew (2021) with small sample observation. This study is unique as it contributes much to the existing body of knowledge. First, this study has considered wider manufacturing sub sectors including Agro Processing Industry, Chemical and Pharmaceutical Industry, Leather and Leather Product Industry, Metal and Engineering Industry, Non-Metallic Mineral Product Industry, Paper and Paper Product Industry, Rubber and Plastic Industry Textile, Apparel Industry and Wood and Wood Product Industry. Second, the study accounted for an improved sample size and with better panel data observation. Third, in addition to the usual measures of financial performance, such as Return on Asset (ROA), this study introduced Net Operating Profitability (NOP), a measure operating profitability, which is less represented in empirical literature. Fourth, this study employed robust model using panel random effect model to examine the effect of capital structure on different measures of performance, instead of simple Ordinary Least Square (OLS) based on relevant diagnostic tests. Finally, almost majority former empirical studies neglect the exogenous assumption while investigating the dynamic relationship between capital structure and performance. In addition to static random effect panel model, this study employed two step system Generalized Moment Method (GMM) which is a recent issue to account for potential endogeneity problem including the reverse causality while indicating a complete results of both analytical methodology at same time.

To this end, this research contributes to improve an understanding as to how capital structure relate with the performance of manufacturing companies and has obtained additional evidence of the pecking order theory of capital structure and its detrimental effect on performance that well explains the aforementioned relationship with special reference to Ethiopian manufacturing companies. This study also considered wider manufacturing subsectors, with an improved sample size, incorporated varies proxies of capital structure and performance, and employed both static and dynamic panel data methodology, which are less represented in the existing literature and not well documented. To this end, the study contributes a bit to the various stakeholders including the financial managers and government, through sharing an empirically tested knowledge.

Therefore, the sole purpose of the present study was to investigate the capital structure of Ethiopian manufacturing companies and how it affects their financial performance. Particularly, the study has empirically addressed the following 3-fold specific objectives (1) to describe the nature of capital structure of Ethiopian manufacturing companies; (2) to establish the relationship between capital structure and performance of manufacturing companies in Ethiopia; and (3) to examine the effect of capital structure on the performance of Ethiopian manufacturing companies.

The remaining part of the study is organized as follows. [Section 2](#) discusses the relevant literature of the study. [Section 3](#) explains data and methodology used in the study. [Section 4](#) shows the results of the empirical analysis and discussions. Finally, [Section 5](#) presents conclusion, recommendations, and directions for future research.

## 2. Literature review

This part discusses theoretical prepositions and empirical debates that have been done and published by eminent finance scholars. Since Franco Modigliani and Merton Miller made their observation about

the relevance of capital structure in 1958, finance scholars have developed additional capital structure theories to determine whether there is an ideal capital structure that enhances business performance. These theories' summaries are divided into two groups and succinctly and precisely described below in accordance with their chronological order.

Wealth maximization is the ultimate goal of all finance decisions, so it is crucial to examine the relationship between capital structure and performance. In accordance with Ross et al. (1999) and Olusola et al. (2022), financing structure entails a choice regarding the debt equity mix of the statement of financial position or balance sheet, as well as all short- and long-term enterprises' capital. In terms of long-term financing, a firm's capital structure includes that choice. Brigham and Ehrhardt (2002) and Van Horn et al. (2008) both discussed how a capital structure is made up of the proportion of debt, preferred stock, and common stock, whereas financial leverage entails the amount of debt a firm has in its capital structure. The optimal capital structure, as defined by Brigham and Ehrhardt (2002), is the level of debt equity mix that minimizes the weighted average cost of capital while at the same time maximizing the performance as measured by its stock price, operating results, financial health, and other performance indicators.

In relation to the irrelevance capital structure theory, Modigliani and Miller (1958) demonstrated that the choice between debt and equity financing has no impact on the cost of capital and value of a firm under the assumption that the capital market is flawless and frictionless, where there are no taxes, no bankruptcy costs, and no friction in the capital markets. As an illustration, Perri and Cela (2022) discovered that capital structure, as measured by debt ratio and other similar ratios, has no discernible impact on profitability. According to Perri and Cela (2022), the reason why DER has such a substantial impact on ROE is that ROE, as a performance metric, typically reflects the company's financing decisions, in contrast to ROA, which does not in the way that it is computed. Since taxes are present and the capital market has improved, the analysis backs up this irrelevance theory of capital structure from 1958. However, in the real world, there are bankruptcy costs, taxes, information asymmetry, and agency costs. As a result, other theories were developed and proved the existence of an optimal capital structure and how the choice of financing affects a firm's performance. A trade-off theory highlights taxes, the pecking order theory concentrates on information asymmetry, and the free cash flow theory concentrates on agency costs, all of which are favouring the relevance of capital structure. These are only a few of the concerns that the many new theories take into consideration. The study of Perri and Cela (2022) looked at how capital structure affected the profitability of 53 Albanian construction enterprises between 2016 and 2019. The TOD, the current liabilities to total liabilities ratio (CLL), the ratio of current liabilities to total liabilities (STD), the LTD, the debt to equity (DER), and the ratio of financial liabilities to total liabilities (FLL) were employed as six capital structure proxies in the study. ROA and ROE metrics were employed in the study to gauge profitability. Except for DER, which has a favorable and large impact on ROE, the analysis indicated that all capital structure proxies have no meaningful impact on ROA and ROE.

Later, taxes were taken into account as Modigliani and Miller (1963) re-examined the connection between capital structure and corporate value. Modigliani and Miller came to the conclusion that a company's ideal capital structure should consist entirely of debt because leverage will raise the value of the company since tax-deductible expenses will result in an interest tax shield. However, given that there are several other unresolved concerns, such as information asymmetry and agency costs, this looks irrational in reality and has led to the development of alternative theories. Olusola et al. (2022) examined and discovered that total debt ratio (TOD) with a higher mean value of 0.7382 has positive and significant effect on ROA despite the fact that it is unrealistic to create businesses with 100% debt or with no equity participation. This study indicated that highly leveraged firms have an enhanced performance.

Trade-off theory holds that there exists an offsetting effect between the expense of bankruptcy and the tax benefits of debt financing. According to Myers and Majiuf (1984), debt financing provides the advantage of an interest tax shield, which increases profits for businesses because interest is tax deductible. The theory states that, up to a certain level (target capital structure), using debt improves performance because the interest expense is tax deductible, which is a benefit of doing so. However, beyond that limit, the cost of financial distress outweighs the interest tax shield benefit of using debt because there are costs associated with bankruptcy, reorganization, and agency work. This theory assumes that

managers are acting in the best interests of shareholders by making sure that the interest tax shield exceeds the cost of financial distress, as claimed also by Fama and French (2002). This argument implies a positive association between debt financing and performance. According to the study by Ayalew (2021), the capital structure has a favourable impact on ROA, with the profitability of businesses improving as debt levels rose.

While it is in the best interest of shareholders to maximize their present value of wealth, managers may act against the best interests of shareholders by requesting expensive salaries, incentives, and job security, as well as, in extreme cases, capturing assets and cash flow of the company, which can lead to agency problems and the consequent incurrence of agency costs. Regarding the use of free cash flow, Jensen and Meckling (1976) noted the existence of the agency problem, which is connected to the agency cost of equity charged by shareholders to monitor managers' behaviour and the agency cost of debt charged by managers to track and manage costs associated with the transfer of value from creditors to shareholders.

To eliminate the cash flow that managers could use as they saw fit, Jensen (1986) proposed the control hypothesis. This involved bonding the managers' commitment to make the interest and principal payments that, if they failed to do so, would bankrupt the company. Thus, Jensen (1986) argues that debt financing can be used as a management tool for firms with free cash flow to ensure that managers reduce agency cost of equity by investing free cash flow in projects with positive net present values rather than elsewhere, motivating managers to create their efficiency through debt servicing roles and obtaining the benefit of tax deductibility of interest, and ultimately creating wealth for the equity-holders.

Myers (2001) also makes the case that lowering equity financing for hazardous companies can be used as a weapon to reduce agency costs of debt by moving risk from owners to creditors, even when doing so increases the direct and indirect costs of financial instability. Therefore, businesses must employ debt only up to the point where the interest tax protection benefits and a reduced agency cost outweigh the danger of default and bankruptcy. According to the trade-off theory, managers should ensure the benefits of debt financing in minimizing the agency cost of debt and equity, creating efficiency on free cash flow, and obtaining interest tax shield that outweigh the cost of financial distress, as claimed also by Fama and French (2002), to predict a favourable relationship between debt financing and performance. The findings of Mehzabin, Shahriar, Hoque, Wanke, and Azad's study from 2022, which corroborate the agency cost theory of capital structure, show that TOD has a favourable and significant effect on ROA as well as ROE.

Various studies obtained empirical evidence that capital structure has a positive and significant effect on performance using different proxies. For example, Mehzabin et al. (2022) used 15 years of data for the period from 2004 to 2018 to examine the effect of capital structure, operational efficiency, and non-interest income on Return on Assets (ROA) and Return on Equity (ROE) of the banking industry in 28 countries in Asia. They used the Long-Term Debt (LTD) Ratio and the Total Debt to Total Asset (TOD) Ratio to measure leverage. Control variables included in the study were Bank Size (BS), Non-interest Income to Total Asset Ratio (NII), Ratio of Non-Interest Expense to Total Asset Ratio (NIE), Equity to Asset ratio (CAP), and Ratio of Loans to Total Assets (LNT) as indicators of Credit Risk. The study found that TOD had a favorable and significant effect on ROA and ROE. BS and LNT have a negative and significant impact on ROE, but NII, NIE, and CAP have positive and significant effects on ROA and ROE.

Using panel fixed effects; Ayalew (2021) investigated the link between capital structure and profitability of 16 Ethiopian private commercial banks in Ethiopia from 2014 to 2019. While profitability was assessed using ROA and Net Interest Margin (NIM), capital structure was assessed using the TOD and STD. Additionally, control factors, such as bank size, bank age, loan to deposit ratios, cost to revenue ratio, credit risk, and employee productivity were included. According to the findings of fixed effect panel regression, both TOD and STD significantly and favourably affect ROA and NIM. Loan to deposit ratios, credit risk, and employee productivity all have positive and substantial effects on ROA, whereas bank size and the cost to revenue ratio have negative and significant effects. Credit risk and bank size both have a positive and large impact on NIM.

The impact of capital structure on profitability was examined in Narinder and Mahima (2019) study of 50 companies listed on the National Stock Exchange of India between 2008 and 2017. The study

measured capital structure using TOD and ER, and it used ROA and ROE as proxies for profitability. The result indicated that both TOD and TER have positive effects on ROA and ROE.

In a dynamic framework, Kharabsheh et al. (2017) established a correlation between capital structure and performance using data from 70 industrial public companies listed on the Amman Stock Exchange between 2006 and 2016. The study employed two proxies for company performance, such as Return on Equity (ROE) and Return on Assets (ROA), as well as three proxies for capital structure, including Short Term Debt Ratio (STDR), Long Term Debt Ratio (LTD), and Total Debt Ratio (TOD). In addition, the study incorporates control variables like Firm size (FS), tangibility (TAN), risk (Risk), and Growth opportunity. Using two step system General Moment Method (GMM), the study found a positive and significant effect of STDR and TOD on ROA and ROE, whereas LTD is insignificant.

Nirajini and Priya (2013) studied the effect of TOD, DER, and LTD on the financial performance of 11 listed trading companies in Sri Lanka using data for the period between 2006 and 2010, where performance is measured by gross profit margin (GPM), net profit margin (NPM), return on capital employed (ROCE), ROA, and ROE. Nirajini and Priya (2013) found that all capital structure indicators positively affect performance.

In contrast to the above discussion, there are other theories and empirical evidence that entail the negative and significant effect of capital structure on performance. Donaldson (1961) demonstrated that management prefers internally generated funds over using external funds. Subsequently, Myers and Majiuf (1984) proposed the pecking order theory. According to the Pecking order hypothesis, the company should fund its investment with internally generated capital derived from accumulated profit or retained earnings. When there is no accumulated profit, businesses should first look at external borrowing as a backup plan before turning to equity financing as a last resort.

Since managers are insiders and have access to more information about the profitability and future prospects of the company than outside investors, outside investors are worried that the new shares will turn out to be overpriced and that the announcement of a stock issue could lower the stock price. Due to their perception of risk, foreign investors are hesitant to purchase newly issued common stock. Since debt issuance has less of an impact on stock price and sends a less alarming signal to investors than equity issuance when external finance is needed, businesses must use debt financing rather than equity financing to address such issues. As a result, Myers and Majiuf's pecking order theory (1984) describes a specific preference order in which firms should prefer retained earnings to debt, short-term debt over long-term debt, and debt over equity when financing their investment requirement. According to the pecking order hypothesis, obtaining fresh external finance has higher transaction costs than obtaining internal financing since internal funds are free of transaction costs. Therefore, the risk of an investment and the firm's worth are determined by the firm's amount of capital structure. In light of ample internally generated funds, the hypothesis explains why more profitable enterprises have less debt and vice versa. According to Fama and French (2002), this theory implies a poor correlation between capital structure and performance. In connection with this, Akhtar et al. (2019) demonstrated the negative and significant effect of debt to equity ratio on Earnings per Share, consistent with pecking order theory, while Vatavu (2015) found a negative and significant effect of debt ratios on Return on Assets.

Dabi et al. (2023) investigated the effect of Capital structure on the financial performance and on sustainability of 51 Microfinance Institutions of Ghana. The study examined how Debt to Total Asset (TOD), equity-to-asset ratio (ER), and debt-to-equity ratio (DER) affect Return on Assets (ROA). The study also introduced control variables including Firm Size (FS), Risk, Deposit to Loan Ratio (DLR), Real GDP growth, and Inflation. Using fixed effect model, the study found that ER and DER have negative and significant effects on ROA.

Meyad and Kefiyalew (2021) used data on 10 Ethiopian construction firms obtained from the Ministry of Urban Development, Housing, and Construction for the years 2011–2018 to examine the effect of capital structure on profitability. The TOD, STD, and LTD were used in the study to measure capital structure. Additionally, the Fixed Asset Ratio (FAR) and Size of Firm (FS) were included as control variables, and ROE was used as a profitability indicator. The study demonstrated that all capital structure proxies, TOD, LTD, and STD, have negative and significant effect on ROE using OLS regression. FAR has also positive and significant effect on ROE.

Using 10 years data for the period between 2007 and 2016 of 30 listed textile firms, Akhtar et al. (2019) investigated the effect of capital structure on performance. In the study, ROA, ROE, and earnings per share (EPS) were used to gauge performance, while TOD and DER were used to gauge capital structure. The liquidity of the firms was used as a moderator. The study found that DER has a significant and negative impact on EPS. Taking liquidity as a moderating variable, TOD affects ROA, whereas the moderating effect of liquidity with DER affects ROA and EPS.

Vatavu (2015) studied how capital structure affects the financial performance of 196 Romanian listed manufacturing companies listed on the Bucharest Stock Exchange for 8-years period between 2003 and 2010. Vatavu (2015) used LTD, STD, TOD, and ER as the capital structure indicators, while ROA and ROE were used as the performance proxies. In addition, control variables like tangibility, tax, business risk, liquidity, and inflation were used. By employing fixed effect multiple regression model, the TOD has negative and significant impact on ROA, which indicates that as more debt is employed by firms, the less profitable they will be. The STD also has negative and significant impact on the ROA. The ER has positive and significant effect on ROA which indicates that companies are more profitable when they keep high ER in their financial structure. In relation to ROE, only TOD and STD showed a negative and statistically significant impact on contrary, equity has a statistically positive effect on ROE.

Mwangi et al. (2014) used secondary financial data of 42 Listed on the Nairobi Securities Exchange, Kenya, in an attempt to establish relationship between STD, LTD, and TOD with profitability measured by ROE and ROA. According to the random effects panel data models using feasible Generalized Least Square (FGLS) regression result of the study, STD, LTD, and TOD have negative effects on ROE and ROA; consequently, managers were recommended to reduce the reliance on debt financing.

Soumadi and Hayajneh (2012) looked into how TOD affected the ROE and Tobin q of the 76 Jordanian public companies engaged in non-financial listed on the Amman stock exchange between for the period between 2001 and 2006. Additional control variables included asset tangibility, firm growth, and size. The OLS result revealed that capital structure associates negatively and statistically significant with firm performance.

Zeitun and Tian (2007) studied the effect of LTD, STD, TOD, and ER on ROA, ROE, and Tobin-q market based performance ratio using a sample of 167 Jordanian companies from 1989 to 2003. The study used tangibility, tax, growth, size, and standard deviation of cash flow as control variables. The result showed that LTD and TOD had a significantly negative impact on the firm's performance measures, in both the accounting measures, such as ROA and Tobin q market's measures.

Apart from the theories and empirical evidence of positive or negative effect of capital structure on performance, there are also studies that obtained mixed results about the relationship using various proxies. For example, Olusola et al. (2022) employed a panel data model to analyze the effect of capital structure on the performance of 202 enterprises in Hong Kong from 2014 to 2018. The study found that debt ratio has a favorable and significant impact on return on asset; whereas long-term debt to total assets (LTD) was insignificant.

Using data collected for the period from 2015 to 2019, Dinh and Pham (2020) investigated the impact of capital structure on the financial performance of 30 pharmaceutical companies listed on the Vietnam stock market. The study used ROE as the dependent variable and the Equity Ratio (ER), Asset to Equity Ratio (AER), and TOD as independent variables. In addition, the study incorporate control variables like tangibility as measured by fixed asset ratio (FAR), firm size (FS), Fixed Asset to Equity Ratio (FER), and Growth Rate (GR). The study found that AER and TOD have positive and significant effects on ROE while ER has negative and significant effects on ROE. The study also found that FA, FS, FER, and GR have positive and significant effects on ROE.

Using panel data from eleven textile and apparel factories for the period 2009 to 2019, Seyoum et al. (2020) investigated the effect of financial structure on the profitability of 11 textile factories in Ethiopia. The TOD, LTD, STD, DER, long-term debt divided by equity (LDEQ), and short-term debt divided by equity (SDEQ) were used to calculate the capital structure. In addition, FS and Real GDP per capita growth rate were controlled. ROA and ROE were used as proxies for profitability. The results of the correlation study showed that a TOD and LTD had a significant negative correlation with ROA, a significant positive correlation with ROE, and a significant negative correlation with SDEQ. Additionally, GDP and ROA are positively correlated, while FS and ROA are adversely correlated. The study found that LTD and

SDEQ had negative effects on ROA while TOD and SDTA had positive and significant effects. ROA is positively and significantly impacted by GDP and FS. LDEQ has a negative effect on ROE, whereas LTD has a positive effect.

For the years between 2011 and 2015, Mohammad and Hakim (2019) looked into the relationship between capital structure and financial performance of 41 Malaysian construction firms. STD, LTD, and TOD were used as proxies for capital structure, while ROA and ROE were used to measure financial performance. The findings showed that LTD had a favorable and significant impact on ROE. However, STD has a negative effect on ROE.

Mathewos (2016) studied the impact of capital structure on the financial performance of eight selected Ethiopian commercial banks for the period from 2011 to 2015. The study used TOD, DER, and loan to deposit (LNR). The study used ROE and ROA as a measure of profitability. In addition, the study used BS and asset tangibility as measured by Fixed Asset Ratio (FAR) control variables. The study found that while TOD has positive and significant effect on ROA and ROE, DER, BS and FAR have negative and significant effects on ROA and ROE.

Hasan et al. (2014) examined the effect of STD, LTD and TOD on performance measured by earnings per share (EPS), ROE, ROA, and Tobin's Q using a sample of 36 Bangladeshi firms listed in Dhaka Stock Exchange for the period between 2007–2012. The study used the size of the firm as control variable. Using the pooling panel data regression method, the study found that EPS is significantly positively related to STD while significantly negatively related to LTD. The study revealed a significant negative relation between ROA and capital structure proxies. The study concluded that negative effect of capital structure on performance entails evidence in favour of the proposition of Pecking Order Theory.

To summarize, various studies have been conducted aiming at establishing relationship between capital structure and performance of firms. These studies have found contradictory results as far as the relationship is concerned due to many reasons like the proxies used to measure capital structure and performance, different analytical tools, various macro-economic and political factors that are attributable to the study settings. Related to micro economic factors, debt financing has double edged sword effect. In good times, where the macro-economic conditions are good and when firms use the debt efficiently, it positively contributes to performance. During bad times of macro-economic conditions and when firms fail to use the borrowed funds properly in a way that can be used to earn profit, it will create financial risk, lower performance, bankruptcy, and ultimately liquidation, the winding up affair of a firm.

### 3. Data and methodology

To explain the nature of the capital structure and other variables, the study used a descriptive research design in line with a quantitative methodology. Additionally, while explanatory research design was utilized, correlation design was used to establish association. The adopted designs were thought to be suitable for appropriately addressing the study's purpose.

#### 3.1. Sources of data and method of data collection

The secondary data was collected by obtaining four years of financial statements for the period 2017 to 2021 of a sample of 85 manufacturing companies in Ethiopia from the Ministry of Revenue (MoR), where the sample companies report were submitting their financial statement for tax purposes during the specified period.

#### 3.2. Sampling methods and procedures

Purposive sampling was utilized to select an appropriate sample of 85 manufacturing businesses from ten manufacturing industrial sub sectors that operate in Addis Ababa, Ethiopia, and have financial records including income statement and balance sheet for the years 2017 through 2021. To begin with, Addis Ababa is the country's largest and oldest commercial and industrial hub. As a result, the majorities of manufacturing firms in Ethiopia are based there and conduct most of their business there, making it possible to infer information about the population from the sample's representation of these firms.

Second, using a sample from various manufacturing industrial sub-sectors allows for a broader investigation of the study under consideration. Agro processing, chemical and Pharmaceutical, Leather and Leather Product, Metal and Engineering, Non-Metallic Mineral Product, Paper and Paper Product, Rubber and Plastic, Textile and Apparel, Wood and Wood Product, and Tobacco Product Manufacturing Industries are some of these industrial sub-sectors. The investigation did not include the Tobacco Product Manufacturing Industry because there is just one company in this sector. Data before 2017 were excluded since not all sample companies were in operation at that time, and data subsequent to 2021 were not easily accessible for all companies at the time this study was being done. To generate a sample that would produce balanced panel data with a total of 425 firm-years of wider observation, and yet to make the study more relevant, the sample size of 85 companies for the years 2017 to 2021 were taken into consideration.

### **3.3. Measurement of variables and hypotheses**

Brigham and Ehrhardt (2002) discussed that many policies and decisions set the fate of profitability, and thus it shows the combined effects of liquidity, assets, and debt management on the profitability of a firm. Consequently, the study incorporated the current ratio (CR) as a proxy for liquidity, fixed assets turnover ratio (FATR) for assets management, and TOD and LTD as capital structure proxies.

The following section discusses the variables and their measurement issue that have been adopted as presented in Brigham and Ehrhardt (2002) and from empirical works of Akhtar et al. (2019), Ayalew (2021), Dinh and Pham (2020), Goyal (2013), Hasan et al. (2014), Kharabsheh et al. (2017), Mehzabin et al. (2022), Mohammad and Hakim (2019), Narinder and Mahima (2019), Olusola et al. (2022), Puspita et al. (2021), Vatavu (2015), Vinasithamb (2015), and Zeitun and Tian (2007) among others.

#### **3.3.1. Dependent variables**

It is rare to use multiple measures of firms' performance and the majority of the existing empirical works focus on how capital structure affects profitability as measured by ROA and ROE, which are commonly known accounting-based and widely accepted measures of performance. In addition to Return on Asset (ROA), this study introduced the measure of operating profitability as measured Net Operating Profitability (NOP).

Hence, the study considered three dependent variables, such as NOP and ROA to measure operating, financial, and overall performance, respectively.

1. Net Operating Profitability (NOP) is a measure of operating profitability, which represents the earning power of assets before the influence of taxes and leverage. It is calculated as the ratio of earnings before interest and tax over total assets as used in Goyal (2013).
2. Return on Asset (ROA) is the measure of how efficient the management is in utilizing all the assets under its control, regardless of the source of financing. It is calculated as the ratio of net income to total assets (Mehzabin et al., 2022).

#### **3.3.2. Independent variables**

Though it is common to use DER as a proxy for capital structure, this study employed TOD and LTD as a proxy for capital structure, which are the independent variables of this study.

The variables have also been used to describe the capital structure of Ethiopian manufacturing companies as the variables indicate the level of debt or leverage employed by the firms. The description and measure of the variables are discussed here:

1. Total Debt Ratio (TOD) is the ratio of total liability to total assets, which indicates the value of total assets in percentage contributed by creditors.
2. Long Term Debt Ratio (LTD) is the ratio of long-term debt to total assets, which indicates the value of total assets in percentage contributed by long term creditors. This measure is incorporated because the short-term debt will constantly be changing in a firm as they are the result of trading or operation.

### 3.3.3. Control variables

This study established the relationship between capital structure, as indicated by TOD and LTD, and financial performance, as gauged by NOP and ROA. The need to include such controllable variables in the model, however, became inescapable because a variety of factors may have affected firms' performance. Only company-specific control variables, which have been shown to be relevant to explaining firm performance in the Ethiopian context as studied by Ayalew (2021), Mathewos (2016), and Meyad and Kefiyalew (2021), were included in the study and have the potential to prevent omitted variable bias. Hence, in the models, the following control variables were used:

1. Liquidity: measure the efficiency of working capital. It is measured as the ratio of current assets to current liability (CR).
2. Fixed Asset Turnover: measures the management's efficiency in utilizing the assets of the firm to bring profit. It is measured as the ratio of sales to total fixed assets (FATR).
3. Firm Size: measures how big a firm is. Though there are many other measures, this study used the natural logarithm of total sales as a proxy for firm's size (FS). It is considered to be a positive determinant of firm's profitability.

The summary of variable description and measurement is presented in Table 1 as follows:

### 3.3.4. Hypothesis

Pecking order theory suggests a detrimental impact; however, theories like agency theory and trade off theory anticipate a positive effect of capital structure on performance. Ayalew (2021), Mehzabin et al. (2022), and other empirical research also indicated positive effect of capital structure on performance, while Akhtar et al. (2019) and Vatavu (2015) reported a negative and significant effect. The following null hypotheses, to be tested at a 5% level of significance, were established to examine how capital structure affects performance in light of the conflicting debates and arguments that have been explored in the existing theoretical prepositions and findings of empirical studies,

H01: Debt ratio has no significant effect on Net Operating Profitability of manufacturing companies in Ethiopia.

H02: Long term debt ratio has no significant effect on Net Operating Profitability of manufacturing companies in Ethiopia.

H03: Debt ratio has no significant effect on Return on Assets of manufacturing companies in Ethiopia.

H04: Long term debt ratio has no significant effect on Return on Assets of manufacturing companies in Ethiopia.

Consequently, the implied alternative hypotheses (Ha1, Ha2, Ha3, and Ha4) that are considered as research hypotheses may be stated as capital structure as measured by TOD and LTD have a significant effect on performance as measured by NOP and ROA.

**Table 1.** Summary presentation of selected variables.

Variables		Notation	Measurements	Source
Dependent	Net operating profitability	NOP	Earnings before interest and tax	Goyal, 2013
	Return on assets	ROA	Total assets Net income	Kharabsheh et al., 2017
Independent	Debt ratio	TOD	Total assets Total liability	Ayalew, 2021
	Long term debt ratio	LTD	Total assets Long term debt	Kharabsheh et al., 2017
Control	Current ratio	CR	Total assets Current assets	Akhtar et al., 2019
	Fixed asset turnover ratio	FATR	Current liability Sales	Puspita et al., 2021
	Firm size	FS	Total fixed assets	Vinasithamb, 2015
			Logarithm of total sales	

### 3.4. Method of data analysis and model specification

After gathering the pertinent data required for the study, the outliers were identified using a boxplot and by examining box-whisker plots. Only a small number of outliers were identified and normalized in accordance with Hoaglin and Iglewicz (1987) winzorization and outliers labelling criteria. Additionally, the Harris-Tsavalis test panel unit root test was used to determine whether the variables were stationary or not. The variables that were taken into account in the study and the nature of the capital structure of manufacturing enterprises in Ethiopia were then described using descriptive statistics, such as mean, variance, standard deviation, minimum, and maximum value. Given that all of the variables were measured, Pearson's correlation was utilized to examine the effect of capital structure on performance.

Three static panel models were evaluated to find the most appropriate model for the data and study the effect of capital structure on firms' performance. These models include pooled, fixed, and random effects. Even though pooled panel data ordinary least square (OLS) regression models are frequently employed by academics, they never account for unobserved firm-specific heterogeneity that is time-invariant and might lead to incomplete and skewed findings.

F-test was used to determine whether a pool or fixed effect model was more appropriate, facilitating the selection of relevant panel models. To determine whether a pool model or random effect model was more suited, the Breusch and Pagan test was applied. The Hausman test was then used to decide whether to specify a random or fixed effects model. The required diagnostic tests were carried out, including the Wooldridge test to check autocorrelation in the data and the Breusch and Pagan test and likelihood ratio test to check for heteroskedasticity in the model. In addition, the Pesaran test was used to test cross-sectional dependence in the panels. Finally, the random effect model was found to be the preferred model but was robusted subsequent to the violation of heteroskedasticity and autocorrelation as recommended by Hoechle (2007). In other words, subsequent to the relevant diagnostic tests, random effect with robust standard error was employed for Models 1 and 2 due to the presence of heteroskedasticity alone. However, due to the presence of first order serial correlation and heteroskedastic variance in the residuals, models 3 and 4 were estimated using random effect multiple regressions with Rogers or clustered standard errors based on the recommendation of Hoechle (2007).

Endogeneity, or the situation where an explanatory variable correlates with the error term, can result in biased and inconsistent estimates, which can lead to incorrect inferences, misleading conclusions, and incorrect theoretical interpretation (Ketokivi & McIntosh, 2017). In their 2018 study, Ullah, Akhtar, and Zaefarian identified three main forms of endogeneity: measurement error, omitted variable bias, and reverse causality/simultaneity. When examining dynamic economic interactions in panel data with a short time horizon (T) and many cross-sections or units (N), endogeneity is taken into consideration using dynamic panel data estimations such as system GMM and difference GMM estimators. According to Baltagi (2008) and recent finance-related studies like Kharabsheh et al. (2017), Yitayaw et al. (2023), and Yousaf and Bris (2021), in dynamic panel models, the system GMM estimator outperforms the difference GMM estimator, especially when T is small and N is big. Therefore, apart from robust random effect model (1, 2, 3, and 4), this study used the dynamic panel data estimation using two step system Generalized Method of Moments (GMM) Model (5, 6, 7, and 8) so as to eliminate the potential sources of endogeneity problem including the reverse causality which may be inherent in the estimated relationship by internally transforming the data and by including lagged values of the dependent variable as recommended by Ullah et al. (2018).

As such, the following eight (8) regression models were employed separately to examine the effect of capital structure on firm's performance. The first four models are robusted static random effect models and models 5–8 are the Dynamic Panel-data Estimation using Generalized Method of Moments (GMM) Model.

#### 3.4.1. The static random effect models

1.  $NOP_{it} = \alpha + \beta_1(TOD_{it}) + \beta_2(CR_{it}) + \beta_3(FATR_{it}) + \beta_4(FS_{it}) + (u_i + \varepsilon_{it})$  (Model 1)
2.  $NOP_{it} = \alpha + \beta_1(LTD_{it}) + \beta_2(CR_{it}) + \beta_3(FATR_{it}) + \beta_4(FS_{it}) + (u_i + \varepsilon_{it})$  (Model 2)
3.  $ROA_{it} = \alpha + \beta_1(TOD_{it}) + \beta_2(CR_{it}) + \beta_3(FATR_{it}) + \beta_4(FS_{it}) + (u_i + \varepsilon_{it})$  (Model 3)
4.  $ROA_{it} = \alpha + \beta_1(LTD_{it}) + \beta_2(CR_{it}) + \beta_3(FATR_{it}) + \beta_4(FS_{it}) + (u_i + \varepsilon_{it})$  (Model 4)

### 3.4.2. Dynamic panel-data estimation using generalized method of moments (GMM) model

$$5. \text{NOP}_{it} = \alpha + \text{NOP}_{it-1} + \beta_1(\text{TOD}_{it}) + \beta_2(\text{CR}_{it}) + \beta_3(\text{FATR}_{it}) + \beta_4(\text{FS}_{it}) + (u_i + v_i + \varepsilon_{it}) \text{ (Model 5)}$$

$$6. \text{NOP}_{it} = \alpha + \text{NOP}_{it-1} + \beta_1(\text{LTD}_{it}) + \beta_2(\text{CR}_{it}) + \beta_3(\text{FATR}_{it}) + \beta_4(\text{FS}_{it}) + (u_i + v_i + \varepsilon_{it}) \text{ (Model 6)}$$

$$7. \text{ROA}_{it} = \alpha + \text{ROA}_{it-1} + \beta_1(\text{TOD}_{it}) + \beta_2(\text{CR}_{it}) + \beta_3(\text{FATR}_{it}) + \beta_4(\text{FS}_{it}) + (u_i + v_i + \varepsilon_{it}) \text{ (Model 7)}$$

$$8. \text{ROA}_{it} = \alpha + \text{ROA}_{it-1} + \beta_1(\text{LTD}_{it}) + \beta_2(\text{CR}_{it}) + \beta_3(\text{FATR}_{it}) + \beta_4(\text{FS}_{it}) + (u_i + v_i + \varepsilon_{it}) \text{ (Model 8)}$$

Where,  $\text{NOP}_{it}$  stands for Net Operating Profitability,  $\text{ROA}_{it}$  for Return on Assets,  $\text{NOP}_{it-1}$  for one lag of  $\text{NOP}_{it}$ ,  $\text{ROA}_{it-1}$  for one lag of  $\text{ROA}_{it}$ ,  $\text{TOD}_{it}$  for Total Debt Ratio,  $\text{LTD}_{it}$  for Long Term Debt Ratio,  $\text{CR}_{it}$  for Current Ratio,  $\text{FS}_{it}$  for Natural log of Firm's age,  $\text{FATR}_{it}$  for Fixed Asset Turnover Ratio,  $\alpha$  for intercept,  $\beta_i$  for coefficients of independent and control variables,  $u_i$  = group specific random effect,  $v_t$  for a time-specific factor,  $\varepsilon_{it}$  for idiosyncratic error term,  $i$  for firms from 1 to 85, and  $t$  for time in years from 2017 to 2021.

## 4. Results and discussion

This section presents the result and discussion of the study using descriptive statistics, correlation analysis, and the econometrics model adopted in three sections.

### 4.1. Descriptive statistics

Table 1 shows the result of descriptive statistics, such as variations, mean, standard deviation, minimum, and maximum values of the dependent and explanatory variables.

Table 2 shows that all variables have more between variations than within variation, showing that the random effect model is acceptable because variances are greater between panels than within panels. The dependent variables, NOP and ROA, are shown in Panel A of Table 2, while the explanatory factors, TOD and LTD, which are the variables of interest in this research, are shown in Panel C. In addition, three control variables, CR, FATR, and FS are shown in Panel B.

As far as the nature of capital structure that reflects the debt equity mix of companies is concerned, Panel A indicates that a mean value of TOD of 0.461 with standard deviation of 0.252, minimum value of 0.00, and maximum value. The mean value of 0.461 implies that 46.2% of the firms' investments are financed with debt. In other words, it can be said that the manufacturing companies have a mean value of debt equity ratio of 0.855, which implies that the manufacturing companies are financing their asset by 0.855 cents from creditors relative to one birr (Ethiopian currency) equity capital contributed by shareholders. This result indicates that the manufacturing companies in Ethiopia are moderately leveraged with standard deviation of 0.252. The maximum value of 1.000 indicates that there are highly leveraged manufacturing companies that operate in Ethiopia with high degree of financial risk as opposed to all most all equity firms with an equity ratio of 1.000 with low financial risk.

LTD has a mean value of 0.124, indicating that manufacturing enterprises have built up long-term obligations of 12.4% of their assets, with a standard deviation of 0.170. This indicates that the majority of the long-term source of finance—roughly 87.6%—comes from equity sources, which can either come from equity contributions or retained profits. The maximum value of 0.89 indicates that there are manufacturing companies that rely on long term debt sources as opposed to companies that rely on current liability.

With respect to the control variables in Panel B, the mean value of CR is 3.287 which indicates that the sample manufacturing companies reserved about three birr (Ethiopian Currency) in the current

**Table 2.** Descriptive statistics of variables.

Panel	Variable	Mean	Std. dev	Min	Max	Obs
A	TOD	0.461	0.252	0.000	1.000	425
	LTD	0.124	0.170	−0.160	0.890	425
B	CR	3.287	3.675	0.030	35.070	425
	FATR	6.962	6.752	0.010	37.640	425
	FS	7.899	0.450	6.470	9.230	425
C	NOP	0.152	0.200	−1.820	1.010	425
	ROA	0.099	0.119	−0.670	0.480	425

assets to pay one birr current liability. There are companies with CR of 35.070 that reserve more current assets to stay liquid as opposed to a company with a CR of 0.03, which is illiquid to pay current liabilities when they come due. The mean value of Fixed Assets Turnover Ratio (FATR) is 6.962 which indicates that one Birr investment in fixed assets generates about 6.962 Birr of sale with a standard deviation of 6.752. The minimum value of 0.010 indicates that there are companies with a very low or poor fixed asset utilization as opposed to those that have a maximum value of 37.640 where fixed assets are utilized to generate a high rate of sales. FS has an average value of 7.899 with a standard deviation of 0.450 and a range of 2.76, which implies that the size of sampled manufacturing companies is more or less near.

As the dependent variables in Panel C indicate, the Net Operating Profitability (NOP) has a mean value of 0.152, which indicates that manufacturing companies are getting earnings before interest and tax (EBIT) of 15.9% on invested assets with a standard deviation of 0.200. There are companies with NOP of  $-1.820$  with a maximum ratio of 1.010, which earns EBIT that exceeds the invested assets. The ROA has a mean value of 0.099, which indicates that manufacturing companies are earning about a 9.9% rate of return on invested assets with a standard deviation of 0.119. There are companies with an ROA of  $-0.670$  indicating the existence of companies that experience loss as opposed to those companies that earn a maximum ROA of 0.480 indicating that there are companies that generate a high rate of profit using their total asset.

## 4.2. Correlation

The results of Pearson's correlation are shown in Table 3 below, and it is clear that LTD has a negative and significant correlation with both NOP and ROA. This indicates that the variables are inversely related, indicating that an increase in LTD is associated with a drop in NOP and ROA. The findings of this study, among others, are in line with those of Seyoum et al. (2020); however, they do not line up with those of Mehzabin et al. (2022). Furthermore, FATR and FS have a positive and significant correlation with NOP and ROA, which indicates that fixed asset utilization and the increase in the size of firms are positively associated with performance. The study by Seyoum et al. (2020) discovered a positive and significant correlation between FS with NOP and ROA, while Mehzabin et al. (2022) found the same thing.

## 4.3. Diagnostic tests of models

This section discusses the result of the diagnostic test and then the empirical finding as to how capital structure affects the performance of manufacturing firms in Ethiopia.

### 4.3.1. Panel unit root test result

To determine if the variables are stationary or not and to prevent spurious regression results using the Harris-Tsavalis test of panel unit root was employed for variables, as shown in Table 4. The Harris-Tsavalis panel unit root test has the favourable size and power qualities in many datasets, particularly in microeconomics where the temporal dimension,  $T$ , is small and the panels exceed 25. Given that the related variables'  $p$ -values were significant, the Harris Tsavalis test's null hypothesis—according to which all the panels have a unit root—was rejected. According to the study's findings, none of the variables

**Table 3.** Pearson's correlation matrix.

	NOP	ROA	TOD	LTD	CR	FATR	FS
NOP	1.0000						
ROA	0.9115***	1.000					
TOD	-0.0731	-0.1436***	1.000				
LTD	-0.1696***	-0.2475***	0.4245***	1.000			
CR	-0.0096	0.0022	-0.5108***	0.0202	1.000		
FATR	0.3737***	0.4183***	0.0426	-0.1632***	0.067	1.000	
FS	0.1598***	0.1595***	0.0242	0.0899*	-0.1759***	0.0628	1.000

\* and \*\*\* denote significant level at 10 and 1%, respectively.

**Table 4.** Harris–Tsavalis panel unit root test result.

Rho	NOP	ROA	TOD	LTD	CR	FATR	FS
Statistic	−0.187	−0.0082	0.221	0.1369	0.1215	0.0053	0.2768
z	−12.9973	−9.6149	−5.2809	−6.8689	−7.1603	−9.3583	−4.2226
p-Value	0.000	0.000	0.000	0.000	0.000	0.000	0.000

**Table 5.** Result of diagnostic tests for model 1 to model 6.

No	Specification and diagnostic tests	Models			
		1	2	3	4
1	Hausman: $\chi^2(4)$	3.560	6.110	6.440	6.640
	Prob > $\chi^2$	0.469	0.191	0.168	0.156
2	Multicollinearity: average VIF	1.220	1.040	1.220	1.040
	Heteroscedasticity: $\text{chibar}^2(01)$	78.250	76.870	178.560	175.920
3	Prob > $\text{chibar}^2$	0.000	0.000	0.000	0.000
	Likelihood-ratio test: LR $\text{hi}^2(84)$	463.480	455.100	321.630	311.220
4	Prob > $\chi^2$	0.000	0.000	0.000	0.000
	Serial correlation: $F(1, 84)$	2.534	2.366	12.411	11.738
5	Prob > $F$	0.115	0.128	0.001	0.000
	Cross-sectional: PCD statistics	−0.854	−0.905	−0.847	−0.949
5	Independence p-value	0.393	0.365	0.397	0.343
	Off-diagonals	0.442	0.446	0.449	0.455

under examination had a unit root; hence they were all employed at levels rather than their initial difference. This indicates that the results were not spurious (Gujarati, 2004).

#### 4.3.2. Multicollinearity test result

As presented in Table 3, all variables had  $<0.8$  correlation coefficients indicating that the study data did not exhibit severe multicollinearity (Gujarati, 2004). In addition, to validate the presence of multicollinearity among the independent variables, variance inflation factor (VIF) was used and as it can be seen in Table 5, the result showed that the average VIF for Model 1 and 3 was 1.220 and for Model 2 and 4 was 1.040. This indicates that there was no multicollinearity among the explanatory variables.

#### 4.3.3. Hausman specification test of model

From the null hypothesis of pooled OLS and the alternative hypothesis of fixed effect, the suitable model was determined using the  $F$ -test. All of the models'  $F$ -test results were significant, proving that the fixed effect model was the most suitable one. The alternative hypothesis of the random effect model or the null hypothesis of the pool OLS was then evaluated using the Breusch and Pagan  $\text{chibar}^2(01)$  test. Breusch and Pagan's  $\text{chibar}^2(01)$  test results showed that the random effect model was suitable in all cases where they were significant. The Hausman test was then used to compare the two individual effect panel regression models, with the null hypothesis being that random effects are favoured above alternative hypotheses involving fixed effects. Table 5 shows that the Hausman test's  $\chi^2$  value has an insignificant  $p$ -value. As a result, when studying the effect of capital structure on the performance of manufacturing enterprises in Ethiopia, the random effect (RE) model was discovered to be the most effective model for all of the offered models from the three static panel models.

#### 4.3.4. Heteroskedasticity test results

Following the result of Hausman test where the test failed to reject the null hypothesis that the preferred model is random, the Breusch and Pagan test for random effects was used and the result of the test for all models has  $\text{chibar}$  square value which is significant at 1 percent significance level indicating the presence of heteroskedasticity in the random effect model. In addition to Breusch and Pagan test, the likelihood ratio test was used to validate the result of the presence of heteroskedasticity and it was found that LR  $\text{chir}$  square value of all models was significant at 1% significance level indicating the presence of heteroskedasticity as presented in Table 5.

#### 4.3.5. Serial correlation test results

To test serial correlation, the study employed the Wooldridge test autocorrelation in the data. While the *F*-test statistic of Models 1 and 2 was insignificant, the test statistics for Models 3 and 4 were statistically significant indicating the problem of first order autocorrelation in the panel data as it can be inferred from Table 5.

#### 4.3.6. Cross-sectional dependence test result of models

The Pesaran (2004) cross-sectional dependence (CD) test was used to determine whether there is cross-sectional dependence in the random effect model. There is no cross-sectional dependence in the cross-sections in the panel data, owing to the Pesaran test of cross-sectional independence's insignificant outcome (see Table 5).

#### 4.3.7. Assumptions of two step system GMM model

According to Ullah et al. (2018), the post-estimation exogeneity assumptions must be met while using the generalized technique of the moment model to validate the outcome of the two step system GMM. One of the underlying presumptions has to do with first order and second order serial correlation. According to the null hypothesis that the error terms of two different time periods are uncorrelated, the Arellano-Bond (AR) test for no autocorrelation/serial correlation was utilized in the study. This suggests that the lagged variables are not correlated with the error term in the performance equation.

The first order Arellano-Bond test (AR (1)) coefficients are significant in Table 6, while the second order Arellano-Bond test (AR (2)) coefficients are insignificant in the four GMM models, confirming the absence of second-order serial correlation in the residuals. Another crucial premise of GMM estimates states that if the instruments are endogenously determined, neither the GMM nor the instruments will be valid. The GMM model's validity and the correctness of the instruments' specifications are assessed using the Sargan test (Ullah et al., 2018).

**Table 6.** Empirical results for model 1 to model 6.

Variables	Random effect model				Two step system GMM model			
	NOP		ROA		NOP		ROA	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Independent dependent								
Lag of					0.070	0.079	0.183	0.192
Dependent					0.077	0.076	0.127	0.118
TOD	-0.071*		-0.066**		-0.124**		-0.100***	
	0.042		0.027		0.049		0.032	
LTD		-0.064*		-0.077**		-0.147***		-0.119***
		0.052		0.037		0.054		0.037
CR	-0.003	0.001	-0.002	0.000	-0.011**	-0.003	-0.007**	-0.001
	0.002	0.002	0.002	0.001	0.003	0.002	0.002	0.001
FATR	0.010***	0.009***	0.006***	0.006***	0.013***	0.012***	0.008***	0.007***
	0.002	0.002	0.001	0.001	0.003	0.002	0.001	0.002
FS	0.068***	0.074***	0.043***	0.048***	0.071**	0.079***	0.040**	0.047***
	0.022	0.022	0.016	0.016	0.029	0.028	0.016	0.015
Constant	-0.413**	-0.485***	-0.252*	-0.316**	-0.412**	-0.536**	-0.222**	-0.321***
	0.186	0.175	0.132	0.125	-1.740	0.223	0.125	0.120
Rho	0.319	0.318	0.477	0.476				
Theta	0.453	0.452	0.576	0.575				
R-square	0.247	0.252	0.273	0.272				
Wald chi <sup>2</sup>	32.480	31.220	38.420	37.510	49.620	48.470	77.790	75.100
p-Value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
No of firms	85	85	85	85	85	85	85	85
Observation	420	420	420	420	340	340	340	340
AR(1)					-2.210	-2.350	-3.420	-3.610
p-Value					0.027	0.019	0.001	0.001
AR(2)					0.030	-0.170	0.280	0.060
p-Value					0.978	0.863	0.781	0.956
Sargan test					3.290	3.000	4.210	3.530
p-Value					0.194	0.223	0.122	0.171
Hansen test					2.420	2.310	1.530	1.430
p-Value					0.300	0.315	0.464	0.490

Standard errors are in parentheses; *p*-values denote.

\*\*\**p* < 0.01, \*\**p* < 0.05, \**p* < 0.1.

The null hypothesis of Sargan test was statistically insignificant in the GMM models and the study concluded that the instruments are correctly specified and are exogenous. The other assumption of GMM is the absence of over identified restriction aiming at reducing the severe overfitting problems by many-instruments so as to obtain valid instruments and results. As indicated in Table 6, the study used Hansen test to check over-identified restrictions in the model, and the result of the test statistics is insignificant which indicates that the assumption of over identified restrictions is rejected in the GMM models and can be concluded that the many instrument and overfitting is not the concern of this study. As a result, the two-step GMM estimator passes all post-estimation specification tests, indicating that there is no second-order autocorrelation issue and that the instruments were valid and exogenous.

#### **4.4. Panel model multiple regression of models**

##### **4.4.1. Capital structure and net operating profitability (NOP)**

The Wald  $\chi^2$  (5) for Models 1 and 2 is 32.480 and 31.220, respectively, as shown in the result section of the random effect model in Table 6, which indicates the model's fitness at the 1% level of significance. For Models 1 and 2, the *R* square demonstrates that the random effect estimator explained 24.7 and 25.2% of the variance, respectively. The rho in models 1 and 2 are 31.9 and 2.8%, respectively, indicating that the portion explained by each company's unique term and the remainder are attributed to idiosyncratic mistakes. Theta values of 45.3 and 45.2% for Models 1 and 2, respectively, show that estimates are substantially closer to the within estimates of fixed effect than to the OLS estimates. The coefficients of TOD in model 1 and LTD in model 2 are negative (−0.071) and (−0.064) at 10 and 5% level, respectively, with regard to the results of variables as to their direction, magnitude, and significance in models 1 and 2 related to NOP. The findings show that the NOP of manufacturing companies is negatively and significantly affected by both TOD and LTD. This shows that the NOP decreases when the LTD increases and vice versa. More specifically, an increase in TOD and LTD above the average of manufacturing companies leads to a decrease in NOP by 0.071 and 0.064 cents, respectively.

Also as indicated in the result section of two step system GMM of models 5 and 6 presented in Table 6, the coefficients of TOD and LTD are −0.124 and −0.147 which are negative and statistically significant at 5 and 1% levels. This means that TOD and LTD have negative effects on NOP. In other words, a one unit increase in TOD or LTD would decrease NOP by −0.124 and −0.147 units, holding all other variables constant.

Both the random effect model and two step system GMM model indicate that TOD and LTD have negative and statistically significant effects on NOP. Hence, the first two null hypotheses (Ho1 and Ho2) were rejected in favour of the alternative hypothesis bringing additional evidence that TOD and LTD negatively and significantly affect the NOP. The result of this study is consistence with the proposition of Pecking Order Theory and an empirical finding of Goyal (2013), but inconsistent with the finding of Nirajini and Priya (2013). The inconsistency could have been due to slight differences in measurement as well as the economic conditions where the country operates in. This evidence is rare to find in literature and hence, it is one of the new contributions this study made by indicating how TOD and LTD negatively affect the operating performance of companies as measured by NOP.

##### **4.4.2. Capital structure and financial profitability (ROA)**

As shown in Table 6, the Wald  $\chi^2$  (5) for Models 3 and 4 is 28.42 and 47.91, respectively, demonstrating the model's fitness at the 1% level of significance. The *R*-square demonstrates that for Models 3 and 4, the random effect estimator explained overall variances by 27.3 and 27.2%, respectively. The rho in models 3 and 4 are 47.7 and 47.6%, respectively, indicating that the portion explained by each company's unique term and the remaining portion are attributed to idiosyncratic mistakes. Theta values of 57.6% for Model 3 and 57.5% for Model 4 show that estimates are greatly more similar to the fixed effect within estimates than to the pooled OLS estimates. The coefficients of TOD in model 3 and LTD in model 4 connected to ROA are negative (−0.066) and (−0.077), respectively, and both are statistically significant at 5% level with regard to the direction, magnitude, and significance of the results of the variables. The findings show that the ROA of manufacturing companies is negatively and significantly affected by both TOD in model 3 and LTD in model 4. This indicates that the higher the TOD in model

5 and LTD in model 6, the lower the ROA and vice versa. More specifically, an increase in TOD above the average of a manufacturing company leads decrease in ROA by 0.077 cents. And also, an increase in LTD above the average of a manufacturing company leads decrease in ROA by 0.066 cents.

Moreover, as indicated in the result section of two step systems GMM of models 7 and 8 presented in Table 6, the coefficients of TOD and LTD are  $-0.100$  and  $-0.119$  both of which are negative and statistically significant at 1% level. This means that TOD and LTD have negative effect on NOP. In other words, a one unit increase in TOD or LTD would decrease ROA by  $-0.100$  and  $-0.119$  units, holding all other variables constant.

Both the random effect model (3 and 4) and two step system GMM model (7 and 8) indicate that TOD and LTD have negative and statistically significant effects on ROA. Hence, the last two null hypotheses (H03 and H04) were rejected in favour of alternative hypothesis obtaining additional evidence that the TOD and LTD negatively and significantly affect the ROA. The result of this study is consistence with the proposition of Pecking Order Theory, which implies that companies prefer to use equity capital than debt financing. The finding that a negative and significant effect of TOD on ROA is consistent with the empirical finding of Hasan et al. (2014), Meyad and Kefiyalew (2021), Mwangi et al. (2014), and Zeitun and Tian (2007), but inconsistent with Ayalew (2021), Kharabsheh et al. (2017), Mehzabin et al. (2022), Narinder and Mahima (2019), Olusola et al. (2022), and Seyoum et al. (2020). And also, the finding that a negative and significant effect of LTD on ROA is consistent with the empirical finding of Meyad and Kefiyalew (2021) and Seyoum et al. (2020), but inconsistent with Mohammad and Hakim (2019) where the study found positive and significant result. In contrast, Mehzabin et al. (2022) and Olusola et al. (2022) found an insignificant relationship between LTD and ROA while Perri and Cela (2022) found that both TOD and LTD are insignificant.

As far as concerned with the control variables. The random effect and the two stem system GMM models indicated that both FATR and FS have positive and significant effects on NOP and ROA at the conventional level. This result indicates that an increase in FATR and FS contributes positively to NOP and ROA. The utilization of fixed assets and the increase in the size of companies enhance their performance. Though there is a slight measurement difference in the performance of the companies, the result is consistent with the finding of Mathewos (2016), but inconsistent with the finding of Dinh and Pham (2020). In addition, the two stem system GMM estimations of Models 5 and 7 indicate that CR has a negative and significant effect on NOP at 5% level of significance; however, it has a negative and insignificant effect in the rest of the models. The result of this study is consistent with the findings of Miko and Ajagbonna (2019), but inconsistent with Akinleye and Ogunleye (2019), who have studied the effect of liquidity on profitability.

## 5. Conclusions and recommendations

The study investigated the effect of capital structure on the performance measures of 85 manufacturing companies in Ethiopia using five years data from the year 2017 to 2021 and incorporated financial ratios including debt management ratios, liquidity ratio, asset management ratios, profitability ratio, and one company characteristics variable; viz., FS. Subsequent to the relevant diagnostic tests, the random effect corrected for serial correlation and heteroskedasticity was employed. In addition, two step system GMM model was employed to account for the potential problem of endogeneity. The result showed that the models had good model fitness and explanatory power. As it has been discussed, both proxy of capital structure, TOD and LTD, had negative and statistically significant effects on performance as measured by NOP and ROA at the conventional level of significance. Hence, the four null hypotheses of the study were rejected in favour of alternative hypothesis brining additional evidence that the TOD and LTD negatively and significantly affect the NOP and ROA. The results reveal that as the level of leverage decreases in their capital structure, firms perform better.

The relevance of this finding is that, for manufacturing firms to improve their performance, the decision about the capital structure must be thoroughly investigated. In general, the study's findings are consistent with the Pecking Order Theory's and the empirical conclusion of Hasan et al. (2014), Meyad and Kefiyalew (2021), Mwangi et al. (2014), Nirajini and Priya (2013), and Zeitun and Tian (2007), but inconsistent with agency theory and the empirical findings of Ayalew (2021), Mehzabin et al. (2022), and Olusola et al. (2022). The contradictory results might have been due to the micro and macroeconomic

factors of the firms and countries incorporated in different studies. And also the positive and significant result between FATR with NOP and ROA indicates that manufacturing companies in Ethiopia are more profitable when improving the efficiency of asset utilization. A positive and significant result between FS with NOP, and ROA indicates that an increase in sales volume of Ethiopian manufacturing companies make them more profitable.

Numerous stakeholders, as well as ongoing theoretical and empirical discussions in the literature, will be significantly impacted by the study's findings in terms of policy. First, the results show that higher debt levels and long-term debt have a considerable negative impact on the profitability of Ethiopian manufacturing enterprises. Financial managers are advised to develop long-term financing policies that allow their companies to benefit from lower agency costs while at the same time lowering the likelihood of bankruptcy using a minimal amount of debt.

It is also advised that, given the fact that businesses rely on external borrowing to fund investments, the Ethiopian government regulates the financial sectors by modifying its monetary and fiscal policies to reasonably lower the rate of interest provided specifically to the manufacturing industry. To maintain profitability, businesses are also advised to grow in size and use their fixed assets more effectively to enhance their fixed asset turnover. By collecting empirical data from manufacturing companies in Ethiopia, the study also offers an interpretation of the theoretical and empirical issues concerning the effect of capital structure on performance in favour of the pecking order theory. Future researchers are encouraged to include additional firm characteristics like age, nature, and growth as well as to think about expanding their sample size, time series, and cross-sections while controlling macroeconomic factors that also affect performance. Additionally, as financing decision has a considerable effect on performance, further research into the factors that determine capital structure and the ideal capital structure is a promising future area of study.

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## Data availability statement

Data available in [Mendely Data] at [<https://data.mendeley.com/datasets/vctx8x86m2/draft?a=d0779d38-fa78-42a5-b724-fe9d3211ec24>]. The excel set can also be resent via email.

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