



## Integrated management systems and firm profitability: Multi-way fixed-effects evidence from Pakistani manufacturing firms

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### ABSTRACT

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In an increasingly competitive and sustainability-driven business environment, manufacturing firms are under growing pressure to enhance profitability while maintaining high standards of quality, environmental management, and workplace safety. Integrated Management System (IMS), which combines ISO 9001, ISO 14001, and ISO 45001 standards, offers a comprehensive framework to achieve these objectives. The main aim of this study is to analyze the effect of IMS implementation on the profitability of manufacturing firms. To accomplish this objective, multi-way fixed effects regressions are applied to firm-level panel data. The study employs three alternative measures of firms' profitability, namely, return on assets (ROA), net profit margin (NPM), and return on equity (ROE). The empirical results reveal that firms with IMS exhibit, on average, 2.3 percentage points higher ROA than firms without IMS. Similarly, the NPM of firms with IMS is, on average, 6.1 percentage points higher than that of firms without IMS. These findings indicate that the adoption of IMS significantly enhances the firms' profitability. However, IMS has a statistically insignificant effect on ROE, indicating that it does not significantly influence shareholders' returns. Other explanatory variables, including firm size, asset turnover, and export intensity, also positively affect ROA and NPM. Conversely, firm age has a negative effect on three profitability indicators. Market share is positively associated with ROA and ROE. Furthermore, long-term debt and interest expenses adversely affect the firms' ROA. Findings of this study will benefit manufacturing firms' management and policymakers by helping them to understand how IMS enhances profitability in the manufacturing sector.

**Contribution/Originality:** The present study advances the literature on IMS and its impact on the firms' performance by exploring the profitability effect of IMS through the Resource-Based View. Using a treatment-control design, composed of IMS and non-IMS manufacturing firms, the study offers robust empirical evidence from a developing economy and highlights the strategic value of IMS for improving the firms' performance.

## 1. INTRODUCTION

In response to the growing demand for sustainable goods and services, many firms are striving to stand out in the marketplace. To achieve this, they are reinventing themselves by updating their social policies, management practices, customer relations, and production methods. The call for action on environmental, safety, and health issues is rising steadily. Increasing pressure for transparency, sustainability, and corporate responsibility makes it imperative to address these challenges effectively. The manufacturing firms are becoming more cognizant that

resolving these issues is not only a necessity but also important for sustaining their long-term performance, competitiveness, and survival (Iezzi, 2024). For creating a competitive advantage in the market, recently, various firms have adopted voluntary sustainable initiatives that increase their effectiveness. The management systems standards (MSs) related to product physical and environmental qualities, and occupational health and safety of workers are the most important voluntary sustainable initiatives. Initially, the stand-alone application of MSs was a common practice, and various firms achieved their desired objectives from the stand-alone application of various MSs. However, later, some firms implemented various MSs jointly and experienced a superior outcome from this implementation. Therefore, the implementation of several MSs is nowadays a common practice in the manufacturing industries (Arda, Bayraktar, & Tatoglu, 2019). Various MSs, including ISO 9001, ISO 14001, and ISO 45001, have different policies, processes, and procedures but share important interdependencies related to management, documentation, and operational practices. Recognizing these overlaps, firms increasingly implemented integrated management systems (IMS) to harmonize processes under a unified framework. IMS facilitates alignment across MSs, enabling more efficient resource utilization, streamlined production processes, improved inventory management, and reduced operational costs, which collectively enhance the firms' competitiveness and sustainable performance (Arda et al., 2019).

By consolidating human, material, informational, infrastructural, and financial resources, IMS provides a coherent structure for planning, controlling, and monitoring organizational objectives related to product quality, environmental performance, and occupational safety (Magd & Karyamsetty, 2020). Furthermore, IMS works as a comprehensive platform for communication and knowledge sharing, integrating quality, environmental, and occupational health and safety activities consistent with ISO 9001, ISO 14001, and ISO 45001. It supports proactive efforts to eliminate workplace hazards and mitigate environmental impacts, fostering strong social, labor, and environmental sustainability practices. Due to its broad applicability across diverse sectors, IMS also enhances firms' access to financing, participation in public tenders, and acceptance within competitive markets (Iezzi, 2024). An effective IMS offers several organizational benefits, including the elimination of departmental barriers, improved collaboration, enhanced communication, a stronger organizational culture, a better external image, increased customer satisfaction, higher employee motivation, and greater operational efficiency. Additional advantages include reduced paperwork, lower management costs, decreased internal complexity, simplified certification processes, and stronger support for continuous improvement (Singh, 2025). It also facilitates compliance with domestic and international regulatory requirements related to environmental protection, occupational health and safety, corporate social responsibility, and product or process quality (Marić, Karadžića, Rajković, Moljević, & Jašarević, 2012).

The benefits a firm can derive from the implementation of IMS attracted the attention of researchers. For an instant, Magd and Karyamsetty (2020) developed a conceptual model for the effective implementation of IMS in small and medium enterprises (SMEs). The study found that the adoption of IMS improves competitiveness, providing business stability, enhancing resource efficiency, and increasing resilience during market fluctuations. Likewise, Barbosa, Bueno da Silva, de Souza, and Morioka (2022) linked the implementation of IMS with organizational performance. The study found that the implementation of IMS improves the organizational performance by improved operational performance, cost reductions, sustainable growth, customer satisfaction, and reduction in workplace risks. Shams, Talapatra, Islam, and Abedin (2023) identified substantial advantages of deploying an IMS. The findings of the study identified five key benefits of IMS in Bangladesh's readymade garments industry, including better resource utilization, reduced error and risk ratios, greater business sustainability, better teamwork, and a reduction in duplications. In a similar fashion, Singh (2025) examined the benefits of implementing an IMS in a power generation organization. The study found that IMS implementation leads to a more efficient and streamlined organization.

The remaining researchers bridged a proper link between the implementation of IMS and the firm's performance. For an instant, Arda et al. (2019) tested the influence of IMS on Turkish firm performance. Results of the study indicated that the integration of MSs related to quality and environment improves the performance of firms. In the

same year, Nadae, Carvalho, and Vieira (2019) analyzed the effect of the IMS on the economic performance of firms. Results of the study showed that firms with IMS showed better economic performance compared to firms without IMS. After a one-year gap, Zainol, Ibrahim, Ahmad, Mohd Zahid, and Ab Manaf (2021) analyzed the effect of IMS on the innovation performance of the construction industry in Malaysia. The study found a positive relationship between IMS and the innovation performance of construction firms. In the next year, Rahman, Zahid, and Muhammad (2022) inquired into the impact of IMS on corporate social responsibility and firm financial performance in Bursa Malaysia. Outcomes of the study exhibited a significant positive impact of IMS on corporate social responsibility and financial performance. Similarly, for measuring the employees' insight regarding the effects of IMS on organizational performance, Barbosa, Bueno da Silva, Morioka, da Silva, and de Souza (2023) developed a mathematical model. Results of the model support the earlier researchers' views that the implementation of IMS can improve organizational performance.

From the review of the above studies, it is concluded that the researcher in the past identified substantial benefits of implementing IMS. Few researchers have analyzed the effect of the IMS on the economic, innovation, financial, and organizational performance of the firms. Despite the apparent emphasis on the benefits of IMS implementation, there is a lack of studies that examined its impact on firm performance, especially from a profitability viewpoint. Therefore, a significant research gap exists on the impact of IMS on the profitability of manufacturing firms. To better understand the relationship between the IMS and the firm's profitability, this study empirically analyzes the impact of the IMS on manufacturing firms' profitability. This study compares the profitability of manufacturing firms that implemented IMS against a control group with no IMS. The treatment group is composed of firms that have IMS, while the control group consists of firms with similar features but with no IMS. Numerous accessible profitability indicators are examined and compared, including return on assets, net profit margin, and return on equity. A multi-way fixed effect (time, industry, and city) regression model is used to describe the influence of IMS on profitability.

IMS concept is rather new in Pakistan as compared to other countries. In general, most of the manufacturing firms in the country are not well aware that the implementation of IMS not only improves their management and their internal efficiency but also results in an increase in profitability (Zainol et al., 2021). Businesses in Pakistan may be stimulated to use IMS if the community know better of its benefits. With the assistance of IMS, Pakistan can attract more customers, hardening its status as the leading sustainable product exporter in Asia (Shams et al., 2023). By empirically examining the effect of IMS implementation on firms' profitability, this study offers evidence-based insights into how Pakistani firms can enhance their profitability through systematic integration of management system standards. For policymakers, the findings highlight the importance of promoting IMS as a tool for improving firms' profitability. Moreover, for business managers and industry practitioners, the study underscores IMS as a strategic investment rather than a regulatory burden, demonstrating its potential to strengthen internal processes, build corporate reputation, and increase profitability. Ultimately, the study contributes to Pakistan's broader goals of sustainable industrialization (aligned with SDG 9) and responsible production (SDG 12), supporting the transition toward a more competitive and environmentally responsible manufacturing sector.

## 2. METHODOLOGY

### 2.1. Theoretical Background

The theoretical foundation of this study is based on the Resource-Based View (RBV). According to RBV, the competitive advantage of a firm is based on its unique resources and abilities. These unique resources and abilities enable the firms to form distinctive strategies, processes, and procedures. Moreover, these unique resources and abilities of the firm are indivisible and cannot be easily transferred to other firms. Thus, these resources and abilities provide a competitive edge to the firm in the industry. However, these resources and abilities are changing as per contingency factors from one firm to another, and each firm can use them for improving various dimensions of its

performance. The implementation of the IMS is one of the important examples of the unique resources and abilities of the firm. The implementation of IMS enables a firm to form unique strategies for customer satisfaction, better communication in all departments, one platform for solving complex problems, and improved workers' commitment. Furthermore, the implementation of IMS enables a firm to quickly adjust to market changes and customer expectations by establishing policies regarding quality improvement, environmental proactivity, and social responsibility. Resultantly, these changing and adjusting abilities improve the firm's overall performance, including its profitability. Therefore, quality, environmental, and social performance are some essential indicators in converting quality, environmental, and occupational health management into a capability to improve competitiveness and profitability (Arda et al., 2019).

## 2.2. Data Sources

To examine the association between the IMS and the manufacturing firms' profitability, this study uses panel data from 245 manufacturing firms operating in twelve industrial sectors listed on the PSX (Pakistan Stock Exchange) over a period of fifteen years (2009 to 2023). The information on the number of firms in each industrial sector is given in Table 1. The quantitative data of a private limited firm is not easily available in emerging economies like Pakistan. However, in Pakistan, the data of publicly listed firms are available for stockholders' assistance; therefore, in this study, the data of firms listed on the PSX are used. For the analysis, initially, a total of 301 firms listed on the PSX operating in 12 different industries were selected (State Bank of Pakistan, 2023). However, during the data cleaning process, we identified 56 firms that had discontinued production for several years within the study period (2009 to 2023). Because the objective of the study required continuous operational data to ensure consistent comparison across firms and over time, these firms were excluded from the final dataset. After removing firms with discontinued production, the final dataset consisted of 245 firms that remained operational throughout the entire study period. This cleaning procedure ensured the reliability of the panel structure and minimized biases arising from missing or inconsistent firm-level information. The required data is taken from the firms' annual reports and from the State Bank of Pakistan (2023). The State Bank of Pakistan (2023) provides information on the firms and profitability indicators, including return on equity, return on assets, and net profit margin. Besides, the State Bank of Pakistan (2023) also provides information on the firms' domestic sales, export sales, debt-to-equity ratio, asset turnover, long-term borrowing, and interest expenses. Furthermore, information on the IMS adoption status of firms, firm size, and firm age is obtained by reviewing the firms' annual reports.

**Table 1.** Number of firms in each industrial sector.

| No. | Industrial sector                | Number of firms |
|-----|----------------------------------|-----------------|
| 1   | Textile                          | 94              |
| 2   | Chemicals & pharmaceuticals      | 30              |
| 3   | Sugar                            | 20              |
| 4   | Fuel & energy                    | 17              |
| 5   | Cement                           | 16              |
| 6   | Food                             | 13              |
| 7   | Motor vehicles & auto parts      | 13              |
| 8   | Mineral Products                 | 9               |
| 9   | Coke & refined petroleum         | 6               |
| 10  | Paper & paperboard               | 5               |
| 11  | Electrical machinery & apparatus | 3               |
| 12  | Other manufacturing              | 19              |
|     | Total                            | 245             |

**Source:** State Bank of Pakistan (2023).

### 2.3. Econometric Model

To examine the association between IMS implementation and its consequent impact on the profitability of the firms, this study utilizes the panel data model proposed by Rahman et al. (2022). The model is specified as:

$$\pi_{it} = \alpha_i + IMS_{it}\alpha_1 + x_{it}\alpha_2 + \mu_{it} \quad (1)$$

$$i = 1, \dots, 245$$

Where  $\pi_{it}$  is the profitability of a given firm (return on equity or return on assets or net profit margin),  $IMS_{it}$  is the important explanatory variable, it is basically a dummy and its value is equal to 1 for the firm that already implemented IMS, and its value is equal to 0 if the firm did not implement the IMS.  $x_{it}$  represent the vector of other explanatory variables that have a potential impact on the firm's profitability,  $\mu_{it}$  is the normally distributed residual, and  $\alpha'$ s are the coefficients of the model.  $\alpha_i$  is introduced in the model to capture the firm fixed effects and treat those factors that are almost the same for the firms, it also treats the problem of heterogeneity among the firms. However, the adoption of management system certifications may exhibit limited within-firm variation over time, with many firms either adopting once or remaining certified throughout the sample period. Consequently, firm fixed effects may absorb much of the variation used to identify the coefficients. Expecting the limited within-firm variation in certification status and the resulting loss of statistical significance under firm fixed effects, we treat the firm fixed effects specification as a robustness check rather than the baseline model. Our main results are therefore reported from specifications controlling for time, industry, and city fixed effects:

$$\pi_{it} = \alpha_I + \alpha_t + \alpha_c + IMS_{it}\alpha_1 + x_{it}\alpha_2 + \mu_{it} \quad (2)$$

$$I = 1, \dots, 12, \quad t = 1, \dots, 15, \quad c = 1, \dots, 49$$

$\alpha_I$  is introduced in the model to capture the industry fixed effects and treat those factors that are almost the same for the firms in the given industry, and it also treats the problem of heterogeneity among the industries.  $\alpha_t$  is introduced in the model to capture the time fixed effects and treat the omitted factors that are same for each industry at a given time  $t$ , and  $\alpha_c$  represents the city effect and captures omitted variables that have a potential impact on the  $it$ th firm in the given city. The multi-way fixed effects (Time, industry, and city) panel data model is represented by the equation (2). This model assumes that the unobserved individual effects (Industry-specific, time-specific, and city-specific) are fixed and potentially correlated with the independent variables, ensuring that omitted variable bias due to unobserved heterogeneity is minimized. Additional assumptions include the absence of perfect multicollinearity among the independent variables and independently and normally distributed error terms with zero mean and constant variance. There are three major motives behind the adoption of this model. First, it reduces omitted variable bias by incorporating fixed effects, each fixed effect is correlated with the dependent variable, and validates the coefficients. Second, it captures structural differences among various groups of firms such that structural differences among firms by industry, city, and time. Third, this model controls observed heterogeneity across industry and city over time, which is important for guaranteeing robust estimates of the association among IMS implementation and performance outcomes of firms.

In the above specified model, the dependent variables are: return on assets (Ahmed et al., 2024; Arhinful, Amin, Mensah, Gyamfi, & Obeng, 2025; Khan, 2019; Nguyen et al., 2023) net profit margin (Agus et al., 2020; Freitas, Costa, Domingues, & Carvalho, 2025) and return on equity (Ahmed et al., 2024; Arhinful et al., 2025; Nguyen et al., 2023; Rahman et al., 2022). The important explanatory variable is the IMS dummy; it gets the value 1 if the given firm acquired IMS in year  $t$  (ISO 9001, ISO 14001, and ISO 45001/OHSAS 18001), 0 otherwise (Nadae et al., 2019; Rahman et al., 2022). Other explanatory variables will be included in the model are: firm age and size (Khan, 2019; Rahman et al., 2022) debt equity ratio (Jonović, Barjaktarović, & Stefanović, 2025; Yuliana & Kusumawati, 2024), asset turnover (Agus et al., 2020; Andrade & Oliveros, 2023) exports (Pacheco, Lobo, & Maldonado, 2022; Yang, Liu, & Luo, 2023) market share (Agus et al., 2020; Uşar, 2024) long-term borrowing, and interest expenses (Ahmed et al., 2024; Nguyen et al., 2023).

#### 2.4. Estimation Method

It is the initial stage of empirical analysis; model (1) is estimated using traditional fixed and random effects estimation procedures. In the second stage of estimation, the Hausman test is applied for comparison between the two estimation techniques, and to choose the appropriate estimation technique among the two. The estimated significant Hausman test statistic leads us to choose the fixed effect estimation technique; therefore, the fixed effect estimation procedure is opted because of its ability to overcome the issue of endogeneity, which is a significant problem that arises when unobservable factors influence both the dependent and independent variables (Yucel, Yanik, Dayi, & Benek, 2025). If one estimates the regression model having an endogeneity problem, one will get biased and inconsistent coefficient estimates, which can further reduce the validity and accuracy of the empirical analysis. However, the fixed-effects model efficiently controls such unobservable industry-specific and time-invariant characteristics by allowing each industry to have its own unique intercept (Rahman et al., 2022). This ensures that the relationships observed in the model reflect the true effects of the independent variables, free from the distortions caused by omitted variables. Additionally, the fixed-effects model also addresses the problem of panel heterogeneity, where individual industries possess unique characteristics, such as operational scale or market conditions, that may affect their performance (Jaiswal & Elmarzouky, 2025).

### 3. RESULTS AND DISCUSSIONS

#### 3.1. Summary Statistics

Summary statistics and mean comparison of the variables through t-test are given in Table 2. On the basis of t-test values, a significant difference is observed in the mean values of ROA, NPM, size (ln), exports (ln), market share, long-term debt (ln), and interest expenses (ln) of treatment (firms that implemented IMS) and control groups (firms that did not implement IMS). The mean value of ROA for firms with IMS is twice as high as that for firms without IMS. Similarly, the mean value of NPM for firms with IMS is one-point high as that for firms without IMS. This indicates that the firms with IMS are more profitable than those firms without IMS. Moreover, firms with IMS exhibit a higher mean firm size (ln), with a mean size of 6.6 compared to 6.4 for firms without IMS. This shows that the large-sized firms are more inclined to implement IMS. Interestingly, the mean exports (ln) of the firms without IMS are higher than those of firms with IMS. This validates the views of earlier researchers that firms often implement IMS to raise their exports. The mean market share of firms with IMS is 0.05 points higher than that of firms without IMS. This indicates that the firms with IMS capture a larger market than those firms without IMS.

**Table 2.** Summary statistics.

| Variables            | Definition                                                                             | Firms with IMS | Firms without IMS | t-test  |
|----------------------|----------------------------------------------------------------------------------------|----------------|-------------------|---------|
|                      |                                                                                        | Mean and SE    | Mean and SE       |         |
| ROA                  | Return on assets: Ratio of the given firm's net income to average total assets         | 8.1<br>(0.35)  | 3.5<br>(0.24)     | -9.3*** |
| NPM                  | Net profit margin: ratio of the given firm's net profit to sales                       | 7.4<br>(0.69)  | -6.4<br>(1.4)     | -5.3*** |
| ROE                  | Return on equity: Ratio of the given firm's net income to average shareholders' equity | 22.1<br>(2.2)  | 11.8<br>(3.6)     | -1.4    |
| Firm size (ln)       | Natural logarithm value of number of employees in the given firm                       | 6.6<br>(0.05)  | 6.4<br>(0.03)     | -5.4*** |
| Firm age (ln)        | Natural logarithm value of number of years since the given firm has been in operation  | 3.5<br>(0.02)  | 3.5<br>(0.01)     | -1.03   |
| Debt to equity ratio | Ratio of the given firm's total liabilities to shareholders' equity                    | 2.3<br>(1.1)   | 1.01<br>(0.73)    | -0.81   |

| Variables                | Definition                                                                      | Firms with<br>IMS | Firms without<br>IMS | t-test   |
|--------------------------|---------------------------------------------------------------------------------|-------------------|----------------------|----------|
|                          |                                                                                 | Mean and SE       | Mean and SE          |          |
| Asset turnover           | Ratio of the given firm's sales to average total assets                         | 1.1<br>(0.03)     | 1.2<br>(0.02)        | 0.85     |
| Exports (ln)             | Natural logarithm value of export sales of the given firm                       | 6.6<br>(0.25)     | 8.4<br>(0.13)        | 6.4***   |
| Market share             | Ratio of the given firm's sales to total sales of all the firms in the industry | 0.09<br>(0.004)   | 0.04<br>(0.002)      | -15.7*** |
| Long-term borrowing (ln) | Natural logarithm value of long-term borrowings of the given firm               | 10.4<br>(0.23)    | 9.5<br>(0.11)        | -3.5**   |
| Interest expenses (ln)   | Natural logarithm value of interest expenses of the given firm                  | 11.9<br>(0.12)    | 10.5<br>(0.06)       | -10.3*** |
| Observation              |                                                                                 | 791               | 2,884                |          |

**Note:** Standard errors (SE) in parentheses. \*\*\*, \*\* denote significance at the 1%, 5% levels, respectively.

Furthermore, the mean long-term borrowing (ln) of the firms with IMS is higher than that of firms without IMS. Similarly, the firms with IMS bear higher interest expenses than the firms without IMS. This demonstrates that long-term borrowing is easily available to firms that implemented IMS; however, they also paid higher interest against this borrowing opportunity. Finally, no significant difference is observed among the ROE, age (ln), debt to equity, and asset turnover of both groups of firms.

### 3.2. Regression Results

Initially, the fixed effects model specified in Equation 1 is estimated with firm fixed effects. The results of the firm fixed effects models are reported in Table A in the Appendix. However, once firm fixed effects are introduced, the coefficients of the key explanatory variables become statistically insignificant. These results are expected, as the adoption of management system certifications under the IMS exhibits limited within-firm variation over time; consequently, firm fixed effects absorb much of the variation used to identify the coefficients. To address this issue, the multi-way fixed effects models (time, industry, and city) specified in equation (2) are estimated. The results of the multi-way fixed effects model are provided in Table 3. Three alternative profitability measures are used in this study, namely, return on assets (ROA), net profit margin (NPM), and return on equity (ROE). The multi-way fixed effects models are estimated for the three alternative profitability measures as shown in models 1-3. Based on statistically significant F-statistic values, it is concluded that the explanatory variables as a whole affect the dependent variables. However, the R-squared of the three models ranged from 0.02 to 0.19. The highest R-squared is observed for model (1). Likewise, the values of the Hausman test of the models are statistically significant, which assist us in rejecting the null hypothesis that the random effect models are better than the fixed effect models. Therefore, we proceed with the fixed effect model, and estimated the fixed effects models with industry, time, and city fixed effects as given in Table 3. The values of mean VIF for the three models cannot exceed 10, representing no presence of multicollinearity among the independent variables. The insignificant values of the Wooldridge test confirm no serial correlation in the data. Furthermore, Breusch-Pagan/Cook-Weisberg test statistics are significant for the three models, indicating that the data suffer from the problem of heteroscedasticity. To remove the problem of heteroscedasticity, we used robust standard errors.

In model (1), the estimated statistically significant and positive coefficient of IMS indicates that the ROA of the firms with IMS is on average 2.3 points higher than that of firms with no IMS. Similarly, in model (2), the estimated statistically significant and positive coefficient of IMS indicates that the NPM of the firms with IMS is, on average, 6.1 points higher than that of firms with no IMS. However, in model (3), where the dependent variable is ROE, the estimated coefficient of IMS is statistically insignificant. This indicates that the implementation of IMS improves operational efficiency and overall profitability at the firm level, as reflected in higher returns relative to assets and

better profit margins. However, IMS does not have a significant impact on shareholders' returns. ROA and NPM primarily capture operational performance and cost-efficiency improvements, which IMS directly influences through better resource utilization, quality management, and process standardization. In contrast, ROE is influenced by financial leverage, capital structure, and shareholder returns, which may weaken the direct impact of IMS (Jonović et al., 2025; Wang & Liu, 2023). The implementation of IMS guarantees more comprehensible and profitable production processes because of its ability to integrate different management system procedures. The implementation of IMS enables the firms to use their resources optimally, which further helps in cost savings. Integrating quality, environmental, and health and safety management standards under one management system like IMS can eliminate duplication and improve efficiency, which further leads to improvement in profitability (Podrecca, Molinaro, Sartor, & Orzes, 2024).

Likewise, the implementation of IMS facilitates effective occupational health risks management, which further reduces the chances of employees' workplace injuries and loss of precious human lives. Under the guidelines of IMS, the firms are able to form enhanced health risk management strategies that include active maintenance schedules or better workers' safety measures that reduce the number of workplace incidents and disruptions in the production process. Similarly, the improved image of the firms and the stockholders' satisfaction is also possible due to the proper implementation of the IMS. It is also evident that the implementation of IMS leads the firms to have a more reliable image in the eyes of their customers and potential investors. This is because both the customers and investors seen that the firms have a greater concern for quality, environment, and worker safety issues, which is visible to them that the firms implement international management standards. This positive perception of customers and investors regarding the firms' commitment to sustainability issues increases the customers' satisfaction, the firms' revenue, inward investment into the firms, and the firms' profitability (Manurung & Rachmat, 2019). From the perspective of the Resource-Based View (RBV), integrating quality, environmental, and safety management systems, firms develop unique routines and capabilities that optimize resource utilization and enhance operational performance, thereby increasing profitability. Comparing this finding with previous studies that bridge a link between IMS implementation and performance of firms, Nadae et al. (2019) observed that firms with IMS showed better economic performance compared to firms without IMS. In a similar fashion, Rahman et al. (2022) found a positive mediation of corporate social responsibility in the association between IMS implementation and firm financial performance.

**Table 3.** Results of the multi-way (time, industry, and city) fixed effects models.

| Model:                   | (1)                   | (2)                  | (3)                 |
|--------------------------|-----------------------|----------------------|---------------------|
| Dependent variables:     | ROA                   | NPM                  | ROE                 |
| IMS                      | 2.341***<br>(0.466)   | 6.074***<br>(2.006)  | 5.519<br>(3.562)    |
| Firm size (ln)           | 1.415***<br>(0.258)   | 12.69***<br>(2.172)  | -0.468<br>(3.062)   |
| Firm age (ln)            | -1.023***<br>(0.359)  | -8.404***<br>(2.326) | -5.295**<br>(2.504) |
| Debt to equity ratio     | 0.00467<br>(0.00495)  | 0.0131<br>(0.0193)   | 0.0946<br>(0.114)   |
| Asset turnover           | 3.033***<br>(0.619)   | 9.294***<br>(2.286)  | 4.464<br>(3.017)    |
| Exports (ln)             | 0.233***<br>(0.0375)  | 0.410**<br>(0.193)   | -0.567<br>(0.578)   |
| Market share             | 10.68***<br>(2.921)   | -61.76***<br>(16.28) | 101.2***<br>(30.74) |
| Long-term borrowing (ln) | -0.196***<br>(0.0402) | 0.0632<br>(0.217)    | 0.642<br>(0.622)    |
| Interest expenses (ln)   | -0.264***<br>(0.101)  | -0.554<br>(0.629)    | -0.128<br>(0.682)   |
| Fixed effects            | Industry              | Industry             | Industry            |

| Model:                           | (1)      | (2)        | (3)     |
|----------------------------------|----------|------------|---------|
| Dependent variables:             | ROA      | NPM        | ROE     |
|                                  | Year     | Year       | Year    |
|                                  | City     | City       | City    |
| Constant                         | -4.581** | -53.03***  | -5.983  |
|                                  | (1.936)  | (10.88)    | (17.42) |
| Observations                     | 3,675    | 3,675      | 3,675   |
| R-squared                        | 0.19     | 0.08       | 0.02    |
| F statistics                     | 23.7***  | 5.4***     | 4.4***  |
| Hausman Test                     | 241.4*** | 30.8**     | 11.3*   |
| Mean VIF                         | 1.3      | 1.3        | 1.2     |
| Wooldridge test                  | 3.6      | 0.12       | 0.06    |
| Breusch–Pagan/Cook–Weisberg test | 33.7***  | 10152.5*** | 13.5**  |

**Note:** Standard errors in parentheses. \*\*\*, \*\*, and \* denote significance at the 1%, 5%, and 10% levels, respectively.

Moreover, the estimated positive and significant coefficients of firm size in models (1) and (2) specify that an increment of one employee in the size of the firms brings a 1.4 point increase in their ROA while 12.6 points increase in NPM. Large-sized firms have strong bargaining power with suppliers and customers, improved access to external finance, and greater financial capacity to invest in product and process innovation. These advantages capable the firms to produce more with lower cost per unit, which further enhances the firms' profitability. This finding is consistent with the outcome of Doğan (2013), who observed a significant positive effect of firm size on the profitability (ROA) of the textile firm. Khan (2019) and Rahman et al. (2022) found an insignificant impact of firm size on the firms' profitability (ROA and ROE), respectively. However, the estimated significant but negative coefficients of firm age in the three models show that a one-year increase in the age of the firms lowers their ROA by 1 point, NPM by 8.4 points, and ROE by 5.4 points. This inverse relationship suggests that older firms with outdated technologies, slower decision-making processes, and diminishing innovation capacity may restrict management from responding quickly to changing modern marketing trends. Therefore, over time the older firms' profitability declines. This finding is in contradiction with the outcomes of Khan (2019) and Rahman et al. (2022), who found an insignificant impact of firm age on ROA and ROE, respectively.

Furthermore, the estimated significant and positive coefficients of asset turnover indicate that a one-point increase in asset turnover of firms increases their ROA by 3 points while NPM by 9.3 points. This result suggests that firms that have better operational efficiency and asset utilization tend to be more profitable. The increase in asset turnover indicates that the firm uses its available resources efficiently in generating revenue, which directly improves the firm's profitability. The positive relationship also links with the existing financial theory, which pointed out that efficient asset management enhances a firm's profitability. The findings from Bakir and Sadersah (2023) also support this outcome, who specified that asset turnover has a significant positive effect on ROA.

Besides, the estimated significant and positive coefficients of exports in models (1) and (2) show that a one percent point growth in exports of the firms increases their ROA by 0.2 points whereas NPM by 0.4 points. This outcome postulates that firms that export their products to foreign markets lean towards higher profitability. The export-oriented firms are involved in competition in the foreign market, they have the advantage to get great knowledge and exposure, regrading increasing sales and improving their competitiveness in the foreign markets, which further improves their operational efficiency, competitiveness, and financial performance through developing innovative solutions. Subsequently, the firms viewed export activities as a strategic pathway to improving their overall performance, including their profitability. Compared to other studies, Atkin, Khandelwal, and Osman (2017) found that exporting firms report 16% to 26% higher profits relative to non-exporting firms.

Likewise, the estimated positive and significant coefficients of market share in models (1) and (3) show that a one-point rise in market share of the firms increases their ROA by 10.6 points, whereas ROE by 101 points. This positive relationship suggests that greater market presence of the firms makes them able to get competitive advantages in certain areas, like increasing economies of scale, stronger monopoly power, and enhanced customer loyalty, all of

which contribute further to improved profitability. This finding is also in line with strategic management theories, which elaborate that market dominance or power enables firms to receive higher returns than their counterparts. This outcome aligns with the finding of Gautam, Silwal, and Joshi (2024), who found that a one-point rise in the market share of the firms increases their ROA by 0.19 points. However, the estimated negative and significant coefficient of market share in model (2) shows that a one-point rise in market share of the firms decreases their NPM by 61.7 points. This finding may reflect strategic behavior by firms that prioritize maintaining or expanding their market share through aggressive pricing, discounting, or increased marketing expenditures, which can compress net margins. At the same time, these firms may continue to utilize assets and equity efficiently, as reflected in an increase in ROA and ROE, highlighting a distinction between asset productivity and profit generated per unit of revenue. Similar patterns have been documented in prior empirical studies, where large market-share firms in competitive or saturated markets exhibit lower NPM due to cost pressures and price competition (Gerpott & Berends, 2022).

Finally, in model (1), significant but negative coefficients are observed for long-term debt and interest expenses. This specifies that a one percent growth in long-term debt of the firms decreases their ROA by 0.19 points, while a one percent growth in their interest expenses decreases their ROA by 0.26 points. These results specify that extreme dependence on debt financing may levy a financial load on firms, as higher interest repayment commitments reduce their profitability. These results are also aligned with the pecking order and trade-off theories of capital structure, which state that higher debt levels of the firms increase their financial risk and resultantly reduce their profitability if the debt level is increased beyond a certain threshold. Therefore, it is suggested that firms should sensibly manage their long-term debt and interest expenses to reduce financial risk, maintain financial stability, and sustain profitability. Comparing with other studies, Ahmed et al. (2024) found that the total debt ratio exhibited a substantial negative impact on the ROA of listed firms at the Dhaka Stock Exchange (DSE). Nguyen et al. (2023) found a negative relationship between long-term debt and the profitability of Vietnamese firms.

#### 4. CONCLUSION AND RECOMMENDATIONS

The main aim of this study is to analyze the effect of IMS on the manufacturing firms' profitability. For accomplishing this objective, multi-way fixed effects (time, industry, and city) regressions are applied to the panel data of 245 firms listed at PSX. Results of the study reveal that IMS has a statistically significant and positive impact on ROA and NPM, indicating that the implementation of IMS enhances the firms' profitability. Other firm-specific factors, including firm size, asset turnover, and export intensity, also exert positive effects on ROA and NPM. On the other hand, firm age negatively affects ROA, NPM, and ROE, suggesting that older firms may experience declining profitability. Furthermore, market share positively influences ROA and ROE, while it has a negative effect on NPM. In addition, long-term debt and interest expenses adversely affect the firms' ROA, highlighting the profitability-reducing role of higher financial leverage.

The manufacturing firms undertake different environmental, health, and safety measures to fulfill the increasing demand of their customers for sustainable, safe, and healthy products. Integrating ISO 9001, ISO 14001, and ISO 45001 enables firms to produce goods that comply with these standards. Once customers are satisfied with such products, they are often willing to pay a premium price for them. This implies that firms implementing an IMS can obtain higher prices for their products compared to firms without an IMS. The potential to secure premium pricing further enhances firm profitability. Therefore, it serves as a strong motivation for managers to implement IMS, as it promises price premiums and, consequently, improved profit margins and profitability. Moreover, the integration of ISO 9001, ISO 14001, and ISO 45001 standards into an IMS can help firms to utilize their resources more efficiently, which in turn lowers the per-unit cost of production. This cost reduction enhances firm profitability. The potential for improved efficiency and profitability makes IMS an attractive approach for managers; therefore, it is recommended for firms that have not yet implemented IMS to implement IMS, as it can contribute to sustained financial performance.

This study has certain limitations; first, it examines the influence of IMS on the firm's profitability. However, the active IMS implementation also provides certain other benefits to manufacturing firms, such as reducing the firms' raw materials, energy, and labor costs, increasing their domestic and export competitiveness, boosting their sales growth, and improving their stock market performance. Other researchers can analyze the effect of IMS on these performance outcomes. Besides, the current study is carried out for the listed firms in Pakistan; future research can extend the same analysis to other developing countries.

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## Appendix.

**Table A.** Results of the firm fixed effects models.

| Model:                   | (A)                   | (B)                  | (C)                 |
|--------------------------|-----------------------|----------------------|---------------------|
| Dependent variables:     | ROA                   | NPM                  | ROE                 |
| IMS                      | 0.329<br>(0.498)      | 3.302*<br>(1.816)    | -7.071<br>(13.24)   |
| Firm size (ln)           | -0.105<br>(0.600)     | 13.70***<br>(3.071)  | -10.58*<br>(6.240)  |
| Firm age (ln)            | 0.00121<br>(0.831)    | -7.680*<br>(4.640)   | 17.22<br>(10.64)    |
| Debt to equity ratio     | 0.00494<br>(0.00352)  | 0.0227<br>(0.0198)   | 0.0962<br>(0.113)   |
| Asset turnover           | 3.939***<br>(0.896)   | 7.590***<br>(2.302)  | 5.485*<br>(3.296)   |
| Exports (ln)             | 0.0323<br>(0.0529)    | 0.242<br>(0.239)     | -0.619<br>(0.816)   |
| Market share             | 27.38***<br>(6.777)   | -22.77<br>(19.38)    | 83.26***<br>(27.70) |
| Long-term borrowing (ln) | -0.0966**<br>(0.0385) | -0.140<br>(0.228)    | 0.591<br>(0.634)    |
| Interest expenses (ln)   | -0.255*<br>(0.140)    | -0.0422<br>(0.644)   | -0.645<br>(0.816)   |
| Fixed effect             | Firm                  | Firm                 | Firm                |
| Constant                 | 13.65***<br>(4.479)   | -61.77***<br>(20.31) | 46.58<br>(35.23)    |
| Observations             | 3,675                 | 3,675                | 3,675               |
| R-squared                | 0.42                  | 0.28                 | 0.07                |
| F statistics             | 9.8***                | 11.7***              | 9.5***              |

**Note:** Standard errors in parentheses. \*\*\*, \*\*, and \* denote significance at the 1%, 5%, and 10% levels, respectively.

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