MINHAJ Journal of Economics and Organization Sciences

Volume 6, No.1 /Jan-Jun 2026

Relationship between Inventory Holding and Financial Performance of Manufacturing Companies in Pakistan

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Abstract

This study investigates the effect of inventory holdings on the financial performance (operating profit to sales and gross profit to sales) of 233 manufacturing firms of Pakistan for the period 2014–2018. It specifically examines how raw material inventory to sales (RMIS), work-in-process inventory to sales (WIPIS), and finished goods inventory to sales (FGIS) affect firm performance. Unlike previous studies, this research disaggregates inventory to assess the distinct effects of each component on firm performance. Using the system generalized method of moments for estimation, the empirical findings show significant negative association between total inventory and operating profit to sales and gross profit to sales. Moreover, RMIS and WIPIS also appear negatively associated with firm performance, emphasizing the significance of efficient inventory management in improving the firm profitability.

Keywords: Inventory Holding, Financial Performance, Gross Profit, Sales

Introduction

The most important objective of any business in financial management is to maximize shareholders wealth and profits. To achieve these objectives, firms regularly look for ways to maximize business success (Panigrahi et al., 2024). However, manufacturing companies look for opportunities to improve their business performance, whether the measure is earnings, market share, sales growth, return on investment or another similar metric. As highlighted by Lijuan et al., (2023), inventory serves as the lifeblood of manufacturing activities, ensuring the smooth flow of production and sales. Inventory cost is the cost that occurs for storing the product and it is caused by loss of investment opportunities due to capital associated with it (Cannon, 2008). Moreover, excess and shortage of inventory or stock is harmful for the smooth running of any business because excess or shortage of stock poses various operational difficulties (Panigrahi, 2013). Therefore, conventional thinking suggests

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https://doi.org/10.58932/MULE0064

that keeping stock at an optimal level is an appropriate way to free up capital, which solves operational problems.

A review of the existing literature on inventory and firm performance highlights three major gaps. First, most prior studies assess inventory performance using total inventory value without distinguishing among its individual components, while some examine only one or two elements. Second, the findings of these studies lack broader applicability, as they are predominantly based on data from the United States and other developed economies. Third, much of the existing research is concentrated on a few specific sectors most notably the automotive industry rather than offering a comprehensive analysis across a wider range of manufacturing industries. Furthermore, the literature reveals th**a**t a variety of financial indicators have been employed to assess firm performance, including return on assets (ROA), return on equity (ROE), return on investment (ROI), operating profit, and gross profit. Different scholars use ROA, ROE, and ROI, and they find a positive relationship between inventory and these indicators. (Cui & Li, 2018; Elsayed & Wahba, 2015; Lwiki et al., 2013; Nawaz et al., 2016) Several studies in the literature report a negative association between these financial performance indicators for instance (Cannon, 2008; Obermaier & Donhauser, 2012). However, most of the other studies in literature use operating and gross profit (Capkun et al., 2009; Eroglu & Hofer, 2011; Etale & Bingilar, 2016; Nandan & Choubey, 2019; Shah & Shin, 2007). In these studies, financial performance is taken as a firm's profit to its sales volume because it is a frequently used indicator of the overall profitability of firms, sectors, and industries.

The existing literature discussed only overall inventory or only one or two inventory components at a time. However, no study was conducted with all three components, particularly in the case of Pakistan. Therefore, this study investigates the impact of distinct inventory components, namely raw material inventory (RMI), work-in-process inventory (WIPIS), and finished goods inventory (FGI) on firms' financial performance. Furthermore, this study extends the analysis to encompass all major manufacturing industries, addressing a gap in the existing literature, which has largely focused on a limited number of sectors most notably the automotive industry. Therefore, this study, utilized the data from 12 industries based on manufacturing firms over a five-year period to empirically investigate the connection between inventory and financial performance in Pakistan.

Literature Review

Inventory management plays a key role in determining the financial performance and firm's competitiveness in the industry. In general, voluminous studies have explored the connection between inventory management and firm financial performance. For instance, Malhotra (2001), showed that raw material and work-in-process inventories declined steadily, while trends for finished goods were mixed, with work-in-progress showing the sharpest decrease. Boute et al., (2003) examined inventory trends among Belgian firms across manufacturing sectors. Authors concluded that although inventory levels in Belgian manufacturing firms

declined over time, the reduction was less pronounced than in U.S. industries. Moreover, authors also reported a considerable decline in finished goods inventories particularly in Belgian retail firms, but not among wholesale firms.

Similarly, Gaur et al., (2005) conducted an inclusive analysis of the U.S. retail sector, using Ordinary Least Squared framework. Authors documented a consistent decline in inventory, reflecting rising relative inventory levels across firms. Further, a very small number of firms documented an improved turnover and reduced inventories. In addition to that study also reported that inventory turnover was negatively linked to GPS but positively connected with firm's sales suggesting that declining inventory efficiency may result from shorter product life cycles, and longer lead times due to global outsourcing. Swamidass, (2007) finds a negative association between inventory levels and financial performance. Similarly, Shah and Shin (2007) documented that inventory reduction has a positive effect on firm financial stability. The authors documented that information technology investments enhance operational efficiency, thereby amplifying the connection between inventory holding and financial performance of the US firms.

In addition, Cannon (2008) explored the relationship between inventory holding and financial outcome of US firms. The author reported that there is no influence overall, however, in some context correlations are significantly positive and others are negative. Eroglu and Hofer (2011) analyzed the effects of inventory components using data from U.S. manufacturing firms and reported that different inventory components apply varying influence on financial performance of the firms. In particular, the association between RMIS and financial outcome was found to be stronger than that of WIPS and FGIS. The authors suggested that inventory holding is an important decision and should not be made in isolation, because these inventory components jointly and indirectly determine the financial performance of the firms.

Using an OLS regression Capkun et al., (2009) investigated the impact of different components of inventory on financial performance; they found a significant positive connection between total inventory and its components, with operating and gross profit. Their results further revealed that RMIS shows the strongest link with firm's profitability, representing a closer link between RMIS and financial soundness than that observed for WIPIS. Etale and Bingilar (2016), reported that individual inventory components improve profitability of the firms. Similarly, Nandan and Choubey (2019) reported a statistically significant connection between RMIS and financial soundness, whereas WIPIS and FGIS showed no significant correlation with financial soundness.

The existing studies show that efficient inventory holding is decisive for improving firm financial performance and also significantly influence the operational efficiency, nonetheless its influence varies across the sectors and the various components of inventory. On the other hand, the empirical evidence on the relationship between inventory and financial performance from Pakistan's manufacturing sector remains limited. Therefore, investigating the relationship for

Pakistan's manufacturing firms is therefore necessary to comprehend how inventory management shapes the financial performance.

Data and Methodology

Data collection:

In this study we consider 233 manufacturing firms listed on the Pakistan Stock Exchange (PSX) over the period of 2014 to 2018, across the twelve non-financial industries. Inventory component data were analyzed for five years, as consistent information prior to 2014 was unavailable in the Financial Statement Analysis (FSA) reports published by the State Bank of Pakistan (SBP). The final balanced panel comprises 1,159 firm-year observations, including three inventory components: RMIS, WIPIS, and FGIS. Firms lacking complete data on these components, as well as on sales, costs of goods sold, or total sales, were excluded. The selected industries include textiles, sugar, food products, chemicals, pharmaceuticals, miscellaneous manufacturing, minerals, cement, motor vehicles, auto parts, fuel and energy, petroleum products, paper and paperboard, and electrical machinery sectors in which inventory management constitutes a core operational activity.

Construction of the variables

This study considers the measurement of the operational effectiveness of the firms with the inventory so we consider the variables that are most relevant to determine firm financial performance. The list of variables used in our model is given below. Further formulas and definitions are also discussed after this list by which variables are constructed.

Table 1: *List of the Variables*

Variables	Abbreviations	Computation
Dependent Variables		
Operating Profit To sales	EBITS	Earnings before interest and taxes/ Sales
Gross Profit To sales	GPS	(Sales – Cost of goods sold) / Sales
Independent Variables		
Raw material inv. to sales ratio	RMIS	Average raw-material inv. / Sales
Work in process inv. to sales ratio	WIPIS	Average work-in-process inv. / Sales
Finished goods inv. to sales ratio	FGIS	Average finished goods inv. / Sales
Size of the firm	SIZE	Natural log of total sales
Year dummy	YEAR	Set of year dummy variables
Industry dummy	IND	Set of industry dummy variables

Dependent variables

Financial performance represents the profitability of the firm, which shows operational efficiency that is taken as a dependent variable. In prior literature many ratios are used to measure profitability such as return on assets, economic value-

added, net profit and market share growth. In this research we used performance as a ratio of a firm's profit to its sale volume. This ratio indicates the firm's previous tax profit as a percentage of its sales. By using operating and gross profit, we can determine financial performance at two levels. Therefore, GP shows the added value difference between sales and cost of production. While operating profit reflects profitability after deducting all operating expenses.

EBITS (Earnings before Interest and Taxes to Sales)

EBITS is the ratio of operating profit to sales, which includes all expenses and income except income tax expenses and interest expenses. It is used as an operating profit margin ratio, which measures how much of a company's revenue is left over after paying the company's operating expenses. It is computed as:

$$EBIT_{j,t}\text{-}EBITS_{j,} = SALES_{j,t}$$

where EBIT is earnings before interests and taxes for firm j in year t, Sales are total sales for firm j in year t. Lag EBITS is also included in our model to determine the effect of EBITS on previous year EBITS.

GPS (Gross Profit to Sales)

GPS is the ratio of net operating profit or income to sales, which is the difference between revenue and cost of goods sold divided by revenue. It is used as a gross profit margin ratio, which also shows the financial health of the company by calculating the cost of goods sold and by disclosing the amount left over from the revenue. Further, the lag GPS is also included in our model to determine the effect of GPS on previous-year GPS. It is computed as:

$$SALES_{j,t} - COGS_{j,t}\ GPS_{j,t} = SALES_{j,t}$$

Independent Variables

There are different inventory ratios taken to evaluate the inventory in operations management. The most considerable inventory ratios include inventory turnover, inventory to assets, and inventory to sale ratios. For the performance of the inventory, this study used the inventory-to-sales ratio because by sales we can analyze the inventory level to achieve a certain level of production. Inventory-to-sales ratio also represents overall performance and efficiency of inventory management. The measures of inventory performance variables are discussed below.

INVS (Inventory to Sales Ratio)

The inventory performance measure for total inventory, which includes all components of inventory RMIS, WIPS, and FGIS. Therefore, the inventory-to-sale ratio is the average of total inventory, which is divided by sales. That also indicates the performance of inventory. We scale inventory by sales as follows.

$$(TINV_{j,-1}, TINV_{j,t})TINVS_{j,t} = SALES_{j,t}$$

Sales are total sales of firm *j* for year *t*. Avg is the arithmetic average of inventory levels at the beginning and the end of the year *t.*

RMIS (Raw Material Inventory to Sales Ratio)

Raw materials inventory is the total cost of all component parts currently in stock that have not yet been used in work-in-process or finished goods production. Therefore, the raw material inventory to-sale ratio is the average material holding by the firm to sales. Which is computed as: $(RMI_{j,-1}, RMI_{j,t})$

$$RMIS_{j,} = SALES_{j,t}$$

WIPIS (Work-In-Process Inventory to Sale Ratio)

Work-in-process inventory is a company's partially finished goods waiting for completion and eventual sale or the value of these items. WIPIS is the ratio that indicates the performance of WIP inventory, so it is the average of in-process material held by the firm to sales. Which is computed as:

$$(WIPI_{j,-1}, WIPI_{j,t})WIPIS_{j,} = SALES_{j,t}$$

FGIS (Finished Goods Inventory to Sales Ratio)

Finished goods inventory refers to the number of manufactured products in stock that are available for customers to purchase. So the finished goods inventory to sales ratio is the average FGI holdings of the firm to the sales. Which is computed as: $(FGI_{j,-1}, FGI_{j,t})FGIS_{j,t} = SALES_{j,t}$

Control Variables

For measuring the efficiency of the firm we use a control variable in our model for the firm and industry level variables. This variable shows the changes of the firm's performance and counters the limitations of the model. The variable is:

Size (Firm Size)

Previous studies have shown that firm size effectively affects the firm's profitability. This is based on the concept of economics of scale, which is found in the firm's traditional neoclassical theory (Niresh & Thirunavukkarasu, 2014). Large companies have a consistency of profitability compared to smaller firms. This is because larger firms typically have greater access to resources and possess a stronger capacity to adapt to fluctuations in today's dynamic market environment. (Salman &Yazdanfar, 2012). The size of the firm or enterprise also determines the sensitivity of cash flows to investment Iuliana, (2008). For measuring firm size, the total number of the firm's employees, sales volume, and property amount are the main factors (Salman &Yazdanfar, 2012). However, Gaur and Kesavan (2015) examine the impact of firm size and sales growth rate on inventory turnover, and they measure firm size through annual sales of retail and provide proof that size and sales growth have the potential to change inventory decisions. Therefore, our study is operational, so we use sales volume of firms instead of total assets of the firms. Sales are the most viable indicator to express the size of the firm according to prior literature in the manufacturing industry. The values for the sales are too large; to minimize the values, we take the natural log of total sales.

$$Size = (SALES)$$

To capture heterogeneity across industries and over time, the study incorporates both industry and year dummy variables. The inclusion of industry dummies allows us to assess whether differences in industry characteristics influence profitability, thereby isolating sector-specific effects. Similarly, year dummies are employed to analyze variations in profitability across time, controlling for macroeconomic shocks, policy changes, and other temporal factors. Specifically, "**ind"** represents the set of industry dummy variables, while "**year"** denotes the set of year dummy variables.

Empirical Model

In this study we acclimatize the empirical framework of Capkun et al. (2009) to empirically investigate the association between financial performance and firms' inventory. Therefore, we utilized the following models:

$$\boldsymbol{EBITS_{j,t} = \alpha + \beta_1 EBITS_{j,-1} + \beta_2 SIZE_{j,t} + \beta_3 INVS_{j,t} + \sum_k ind_k + \sum_k year_k + \varepsilon_{j,}} \quad \textit{(1)}$$

$$\boldsymbol{GPSj.t = \alpha + \beta 1 GPSj,-1 + \beta 2 SIZEj,t + \beta 3 INVSj,t + \sum kindk + \sum kyeark + \varepsilon j,t} \quad \textit{(2)}$$

Moreover, the following regression models are estimated considering all three types of inventories

$$\boldsymbol{EBITSj.t = \alpha + \beta 1 EBITSj,t-1 + \beta 2 SIZEj,t + \beta 3 RMISj,t + \beta 3 WIPISj,t + \beta 3 FGISj,t + \sum_k ind_k + \sum_k year_k + \varepsilon_{j,}} \quad \textit{(3)}$$

$$\boldsymbol{GPSj.t = \alpha + \beta 1 GPSj,-1 + \beta 2 SIZEj,t + \beta 3 RMISj,t + \beta 3 WIPISj,t + \beta 3 FGISj,t + \sum kindk + \sum_k year_k + \varepsilon_{j,}} \quad \textit{(4)}$$

where, EBITS denotes operating profit to sales, , while GPS represents the gross profit to sales ratio, further, the firm size is captured by the natural logarithm of total sales as present by (Size). In addition, inventory performance is measured considering multiple indicators, for instance, total inventory to sales is denoted by INVS, raw material inventory to sales is shown by RMIS, similarly, work-in-process inventory to sales is presented by WIPIS, and finally the finished goods inventory to sales is shown by FGIS. Further, we also include a set of industry dummy (ind) and year dummy denoted by year in order to control for heterogeneity.

Estimation Technique

This study used the System Generalized Method of Moments (GMM) estimator due to the dynamic nature of the model. This is generally applicable in the context of semi-parametric models, where the parameter of interest is finite-dimensional, where the full form of the data distribution function is not known, and this is why maximum likelihood estimates do not apply. Caselli et al., (1996) and Bond et al., (2001) show that GMM dynamic panels are capable of correcting unsafe proprietary sophistication, eliminating variable bias, measurement error, and growth problems.

Results and Discussions

Utilizing the panel data from 233 listed firms across the 12 industries over the period 2014–2018, the study uses the GMM estimators to take into account the potential endogeneity among the regressors. The empirical findings are structured around four empirical models as given in equations 1-4. Table 2 presents the empirical findings based on Equation (1), explores the connection between EBITS and INVS. In addition, we include firm size (SIZE) as a control variable to control for the market power and operational capacity in the industry. Further, we also include industry and year dummies in order to control for sectoral and temporal consequences.

Table2: *Results of GMM Estimation for EBITS and INVS*

Variables	Coefficient	Std. Err	t-statistics
$EBITS_{j,t-1}$	0.42***	0.07	6.34
$INVS_{j,t}$	-0.25***	0.04	-5.79
$SIZE_{j,t}$	0.02**	0.01	2.04
Dumtextile	-0.04	0.10	-0.41
Dumsugar	-0.01	0.11	-0.12
Dumfood	0.00	0.10	-0.04
Dumpharma	0.01*	0.10	0.05
Dummanaf	0.04	0.10	0.37
Dumminral	-0.07	0.11	-0.69
Dumcement	0.07	0.10	0.65
Dummoter	0.02	0.10	0.15
Dumenergy	-0.08	0.62	-0.12
Dumpetrol	-0.06	0.12	-0.49
Dumpaper	0.07	0.11	0.61
dum2015	0.01*	0.01	0.86
dum2017	-0.01	0.01	-0.94
dum2018	0.01*	0.01	1.88
_cons	-0.15*	0.07	-2.12
Number of observations =924	Number of instruments = 61		
AR(2) = -0.83	P-value = 0.408		
Hansen = 25.82	P-Value = 0.172		

Note: **, **,*** represent the statistically significant coefficient at 10, 5 and 1 percent levels, Table 4.1 shows the result GMM regression models of relationship of inventory performance and firm performance by using $EBITS_{jt}$ as proxy of firm performance. By taking the sample of 924 firm-year observation of non-financial firms registered in Pakistan stock exchange for the period of 2014 to 2018.*

Our results of the lag EBITS show that lag EBITS has a positive significant effect on current period EBIT; that means an increase in past year performance also increases current year firm performance. However, the total inventory-to-sales ratio has a significant negative relationship with firm performance. It means an increase in inventory leads toward a decrease in profitability because the holding of inventory needs a large space, which increases the storing cost of inventory, and lost investment opportunities because of tied-up capital. The size of the firm has a positive relationship with the operating profit ratio, which reflects that larger firms are more profitable than their counterparts. Furthermore, industry and year dummies have no significant relationship with operating profit, which means financial performance does not change with respect to industry and year variation. The value of AR (2) shows there is no second-order autocorrelation among the regressors. The Henson J-statics test indicates our instruments are not over identified. This model suggests that acceptance of the null hypothesis for non-financial companies of Pakistan indicate INVS affects EBITS negatively and significantly. Regarding total inventory, our findings are consistent with the results of Boute et al., (2011), Obermaier and Donhauser (2012); Cui and Li (2018).

Table 3 shows the empirical findings based on Equation (2), which investigates the relationship between EBITS and the components of inventory. The findings show that lagged EBITS has a positive influence on firm performance. Raw material inventory to sales is found to be negatively and significantly associated with firm performance, implying that retaining excessive raw materials may increase production costs and adversely affect product quality, thereby reducing sales and overall profitability. Similarly, work-in-process inventory to sales demonstrates a negative and significant relationship with EBITS, indicating that higher levels of unfinished goods in the production process can hinder efficiency and exert downward pressure on profits. Finished goods inventory to sales has a significant and negative relationship with EBITS, which means the higher the finished goods kept in stock, the greater the decrease in profit. In this regression, firm size also has a positive relationship with EBITS. Here the industry dummy has a significant relationship, and the year dummy is insignificant. AR2 shows no second order autocorrelation.

Table 3: *Results of GMM Estimation for EBITS with Inventory Components*

Variables	Coefficient	Std. Err	T-Statistics
$EBITS_{j,t-1}$	0.31***	0.05	6.71
$RMIS_{j,t}$	-0.21***	0.03	-6.80
$WIPIS_{j,t}$	-0.53***	0.15	-3.42
$FGIS_{j,t}$	-0.23***	0.05	-4.44
$SIZE_{j,t}$	0.02***	0.01	4.10
Dumtextile	-0.18***	0.06	-2.73
Dumsugar	-0.18***	0.07	-2.63
Dumfood	-0.14**	0.07	-2.10
Dumpharma	-0.13**	0.07	-1.99
Dummanaf	-0.11*	0.07	-1.65
Dumminral	-0.21***	0.08	-2.67
Dumcement	-0.04	0.07	-0.64
Dummoter	-0.12*	0.07	-1.83
Dumenergy	-0.98**	0.40	-2.43
Dumpetrol	-0.21**	0.08	-2.50
Dumpaper	-0.08	0.08	-0.94
dum2015	0.00	0.00	-0.57
dum2017	-0.01	0.00	-1.27
dum2018	0.01***	0.00	3.21
_cons	-0.10*	0.06	-1.67

Note: **, **,*** represent the statistically significant coefficient at 10, 5 and 1 percent levels, Table 4.3 shows the result GMM regression models of relationship of inventory component performance and firm performance. By taking the sample of 924 firm-year observation of non-financial firms registered in Pakistan stock exchange for the period of 2014 to 2018.*

In addition to that, the Hansen J-statistic test confirms the validity of the instruments, with the null hypothesis being accepted. The findings show a significant and negative association between the RMIS and WIPIS, signifying that lower levels of raw material and work-in-process inventories are connected with higher operating profits. These empirical results are in line with Chen et al., (2005), who highlighted the similar findings. However, on the contrary, the FGIS exhibits no significant effect on EBITS, which reflects that finished goods inventory is not a consistent indicator to gauge the firm performance.

In Table 4 we present the empirical results based on Equation (3). Specifically, we investigate the dynamic relation between GPS and INVS. In our

empirical model we incorporate firm size and control for industry and year effects, this model offers a complete understanding of how inventory management shapes profitability performance for the sample period. The lagged GPS has a positive connection with dependent variable GPS, showing persistence in GPS during the sample period. INVS appears significant and negatively linked with GPS, whereas SIZE shows a positive association with GPS. However, in contrast, both industry and year dummies appeared insignificant in the model.

Moreover, the diagnostic tests show no evidence of second-order autocorrelation. Similarly, the empirical results from Equation (3) are consistent with those of Equation (1), as the INVS appears negative in the models. As a result, we accept the null hypothesis; which confirms that firm's inventory unfavorably influences GPS, suggesting that maintaining the lower inventory adds to higher profitability of the manufacturing firms in Pakistan. These findings are in line with existing literature, see for instance, Capkun et al., (2009); Nandan & Choubey (2019).

Table 4: *Results of GMM Estimation for GPS with INVS*

Variable	Coefficien	Std. Err	t-statistic
$GPS_{j,t-1}$	0.51***	0.07	6.82
$INVS_{j,t}$	-0.11***	0.02	-5.06
$SIZE_{j,t}$	0.03**	0.01	2.51
Dumtextile	0.06	0.09	0.69
Dumsugar	0.06	0.10	0.6
Dumfood	0.17*	0.09	1.83
Dumpharma	0.13	0.09	1.38
Dummanaf	0.16*	0.09	1.7
Dumminral	0.07	0.10	0.71
Dumcement	0.15	0.09	1.6
Dummoter	0.11	0.09	1.14
Dumenergy	0.44	0.54	0.81
Dumpetrol	0.00	0.10	0.05
Dumpaper	0.10	0.10	1.05
dum2015	0.00	0.01	-0.65
dum2017	-0.01*	0.01	-2.82
dum2018	-0.01	0.01	-0.93
_cons	-0.54***	0.23	-2.39

Number of observations = 924	Number of instruments = 61
AR(2) = -0.95	P-Value = 0.343
Hansen test = 19.38	P-Value = 0.250

Note: *, **,*** represent the statistically significant coefficient at 10, 5 and 1 percent levels

Table 5 shows empirical findings for Equation (4), in which we examine the association between GPS and all the inventory components (RMIS, WIPIS, and FGIS) offering a wide-range analysis of how various stages of inventory management add to financial result which highlight whether these components serve as key determinants of profitability.

Table 5: *Results of GMM Estimation for GPS with Inventory Components*

Variables	**Coefficient**	**Std. Err**	**t-statistics**
$GPS_{j,t-1}$	0.43***	0.06	6.66
$RMIS_{j,t}$	-0.24***	0.03	-8.23
$WIPIS_{j,t}$	-0.41**	0.18	-2.31
$FGIS_{j,t}$	-0.03	0.05	-0.63
$SIZE_{j,t}$	0.03***	0.01	4.24
Dumtextile	-0.66**	0.29	-2.30
Dumsugar	-0.68**	0.29	-2.37
Dumfood	-0.538*	0.29	-1.87
Dumpharma	-0.59**	0.29	-2.05
Dummanaf	-0.54*	0.28	-1.91
Dumminral	-0.61**	0.29	-2.09
Dumcement	-0.56*	0.29	-1.94
Dummoter	-0.61*	0.29	-2.11
Dumenergy	-0.03	1.64	-0.02
Dumpetrol	-1.27**	0.52	-2.44
Dumpaper	-0.48	0.45	-1.06
dum2015	-0.01**	0.00	-2.28
dum2017	-0.02***	0.00	-3.70
dum2018	0.00	0.00	-0.40

_cons	0.79***	1.13	0.70
Number of observations = 924	Number of instruments = 61		
AR(2) = -0.99	P-value = 0.321		
Hansen test = 34.47	P-value = 0.186		

Note: *, **,*** represent the statistically significant coefficient at 10, 5 and 1 percent levels, Table 4.4 shows the result GMM regression models of relationship of inventory component performance and firm performance by usingGPS_{jt} as proxy of firm performance. By taking the sample of 924 firm-year observation of non-financial firms registered in Pakistan stock exchange for the period of 2014 to 2018.

The results indicate that lagged GPS has a positive and significant effect on current-period GPS. Raw material inventory to sales (RMIS) is negatively and significantly associated with GPS, while work-in-process inventory to sales (WIPIS) also demonstrates a negative and significant relationship. In contrast, finished goods inventory to sales (FGIS) is negative but statistically insignificant, a finding consistent with Kim and Kim (2016). Firm size exhibits a positive relationship with EBITS, whereas both industry and year dummies are statistically significant. The Arellano-Bond AR (2) test confirms the absence of second-order autocorrelation, and the Hansen J-statistic test validates the instruments employed. In general, the results from Equation (4) are consistent with the results of Equation (2). Specifically, both equations emphasize a negative relationship between inventory, its components and firm performance, with RMIS and WIPIS exert a negative influence, while FGIS presents no significant influence on GPS. This reinforces that RMIS and WIPIS play a more crucial role in explaining operational performance. These findings are in line with existing literature, for instance, Nandan and Choubey (2019).

Policy Recommendations

The empirical findings of this study reveal that unnecessary inventory holding negatively impacts financial performance of the manufacturing firms. These empirical findings also hold implications for management, stakeholders and investors, as firms retaining higher inventory levels often signal more uncertainty in terms of their returns. Thus, it is recommended that management and particularly warehouse managers, are encouraged to support modern inventory management practices which are aligned with operational requirements of the firms. Finally, future research may extend to conduct cross-country comparisons, and explore distinct inventory components flanking firms' operating cash flows and country's macroeconomic factors.

Conclusions

Using GMM estimators, we investigate the association between raw materials, work-in-process, and finished goods—considering two different measures

of financial performance, explicitly operating profit to sales and gross profit to sales, for a sample of 233 listed firms across the manufacturing industries of Pakistan for the period of 2014 to 2018. We document statistically significant and negative relationships between total inventory and both performance indicators namely operating profit and gross profit. Likewise, the RMIS and WIPIS display significant and negative relationships with both EBITS and GPS. On the contrary, the FGIS appears statistically insignificant. While inventory components show significant effects on performance metrics, the magnitude of these relationships differs from that of total inventory. In addition, industry dummies mainly appear insignificant with total inventory; however, they show significant impacts with all the inventory components.

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