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# The effect of innovation orientation on firm performance: evidence from micro and small manufacturing firms in selected towns of Awi Zone, Ethiopia

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## Abstract

Innovation in micro and small enterprises is widely regarded as one of the most important sources of sustainable competitive advantage with an embedded purpose of performance improvement in an increasingly changing environment. This study aimed to examine the effect of innovation on the performance of micro and small manufacturing firms in selected towns of Awi Zone, Amhara, Ethiopia. The target population of the study was 643 micro and small manufacturing firms in Injibara, Dangila, and Tilili; a number provided by Awi zone enterprise development office data during 2021. Data were drawn from a sample of 247 manufacturing firms using cross-sectional primary data collected from wood and metal manufacturing firms in selected towns of Awi Zone. The study adopted descriptive and explanatory designs and used correlation and multiple linear regression analysis to estimate the effect of innovation on firm performance. The regression results revealed that product, process, marketing and organizational innovation were positively and significantly related to firm performance, while product innovation was found to have a strong positive effect on the dependent variable firm performance followed by process and organizational innovation, respectively. However, a weak statistical relationship was reported between marketing innovation and the performance of manufacturing firms than other variables. Hence, firms which have a strong orientation towards product, process, organizational and marketing innovation have better performance in manufacturing firms in the study area.

**Keywords:** Innovation, Firm performance, Manufacturing firms, MSEs, Awi Zone

## Introduction

Increased global and local competition has led firms to create or sustain a competitive edge by engaging in innovation. A fast-changing environment with constant abrupt changes makes it indispensable for firms to build up their capability to innovate (Schumpeter, 2010). Innovativeness is not only a matter of interest to scholars in the area of entrepreneurship but has drawn great academic attention, especially in investigating the effect of innovation orientation on firm performance. Among the innovation orientation, product and process innovations are often examined. With the rapid technological

change in recent decades, improved products (product innovation) or alterations in the ways that they are produced (process innovation) are often witnessed in the manufacturing industry (Klewitz & Hansen, 2014; OECD, 1997).

Micro and small enterprises are receiving increasing attention in developing nations for socio-economic development. Like many other economies, Ethiopia is dominated by a large proportion of micro and small enterprises, and the sector is generating substantial economic output. According to the Industrial Development Strategy (IDP, 2013), innovation in micro and small enterprises are the priority sectors and one of the policy instruments of the government to eradicate poverty. The focus of the strategy is to outline the mechanism of interventions to promote industries that have tight linkages with the local economy and in which the country has a competitive advantage. The Growth and Transformational Plan (GTP, 2010) and Industrial Development Strategy (IDP, 2013) outline methods to encourage the development of the industry, particularly the manufacturing sector, through supporting entrepreneurship development schemes, the establishment of sub-sectoral institutes and intellectual property rights protection (ENPC, 2015).

Several studies investigated the effect of innovation on economic development, productivity, growth, and performance improvement (Ayinaddis, 2022; Dessie et al., 2022; Gebreeyesus, 2011; Gunday et al., 2011; Issau et al., 2021; Prifti & Alimehmeti, 2017). These studies have revealed that innovation is a key factor for economic development, including the firms' performance improvement. However, some studies revealed that some dimensions of the innovation types are negatively associated with some dimensions of firm's performance and productivity. For instance, Karabulut (2015) study shows that marketing innovation has negatively associated with learning and growth performance. some studies argued that non-technological innovations (marketing and organizational innovations) have no clear result for their positive and significant effect association. For instance, Ukpabio et. al. (2019), Atalay et. al. (2013), and Cassiman et. al. (2008) studies on the effect of innovation on a firm's performance revealed that product and process innovation has a significant and positive impact on firm performance. However, no significant evidence was found for a positive relationship between non-technological innovation and firms' performance. Conversely, some studies agree that process innovation is more efficient and can support firms better (Ar & Baki, 2011; Morone & Testa, 2008), while others provide evidence supporting the reverse arguments (Issau et al., 2021). Therefore, even though innovation tends to be associated with improvements in economic performance (Mohnen & Hall, 2013), studies remain inconsistent and non-uniform in generalizing the effect of innovation dimensions on firm performance.

Furthermore, despite the development of micro and small enterprise sectors and their contribution to the national economy, the effect of innovation on micro and small manufacturing firms' performance has yet to be studied as well. Few studies such as Andaregie and Astatkie (2022), Kassa and Getnet Mirete (2022), Dessie et. al. (2022), Daksa et. al. (2018), and Gebreeyesus (2011) have tried to look at the determinants or the nexus between innovation and performance in general. Thus, none of the above studies has addressed the effect of innovation, particularly, product, process, marketing, and

organizational innovation on micro and small manufacturing firm's performance in Ethiopia in general and Awi zone in particular.

Therefore, this study attempts to fill this research gap by investigating the effect of four innovation types on micro and small manufacturing firms' performance in Awi zone. Thus, this study explores whether the four innovation types (product, process, marketing, and organizational innovation) have significantly predicted firm performance of micro and small manufacturing firms in Awi zone using descriptive and explanatory research designs. Data were drawn from a sample of 247 manufacturing firms using cross-sectional primary data collected from wood and metal manufacturing firms. Overall, the regression results revealed a strong relationship between the dependent and independent variables.

The rest of this paper is organized as follows. First, the study begins by discussing the relevant theoretical and empirical literature related to the study, followed by the research methodology in conducting the study as well as examining the measures for the study. After that, the results are presented, followed by the discussion section. The final section presents the conclusion and practical implications of the study as well as the future lines of the investigation.

## Theoretical literature

### The concept of innovation and its classification

Innovation (in business) means novelty, new things being done, or old things being done in new ways to increase the performance in terms of sales, profitability and market shares in an organization (Zwingina & Opusunju, 2017). According to the Oslo Manual (OECD, 2005), an innovation comprises the elements of creativity and is defined as the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations. To Hodgetts and Kuratko (2004), innovation is the creation of new wealth or the alteration and enhancement of existing resources to create new wealth. Innovation is also seen as a process of idea creation, developing an invention and ultimately introducing a new product, process or service to the market (Thornhill, 2006).

The first variable that can determine the performance of micro and small manufacturing firms is *product innovation*. According to the OECD's Oslo Manual (OECD, 2005), product innovation can broadly have defined as the introduction of new or significantly improved or modified existing product concerning its characteristics, capabilities, user-friendliness, and components which include improvements in technical specification and materials or other functional characteristics by a firm. Product innovation remains one of the firms' major roots of competitive advantage (Rosli & Sidek, 2013). This is because quality can be enhanced through product innovation, thereby contributing to firms' performance and competitive advantage, respectively. Different studies confirmed the existence of a positive relationship between product innovation and the performance of firms (Atalay et al., 2013; Oduro, 2019; Rosli & Sidek, 2013). According to Corsino and Gabriele (2011), the introduction of new products has a positive influence on sales growth and corporate revenue. To this end, when MSEs adopt product innovation, it

will have a significant influence on their performance. Hence, the first hypothesis of the study is that:

*H1:* Product innovation has a significant positive effect on the performance of manufacturing firms in Ethiopia.

The second variable that was considered in this study was *process innovation*. Process innovation refers to the improvement in the production process, delivery method or supporting activities which includes significant changes in techniques and equipment including bringing significant improvement in the equipment, technology and software of the production or delivery method business (OECD, 2005). Many researchers such as Ar and Baki (2011), Atalay et. al. (2013), Morone and Testa (2008) have found a positive influence of process innovation on firm performance. In their study, Cherrafi et. al. (2018) concluded that implementing process innovation could increase a firm's operational output, customer satisfaction and financial performance. Furthermore, Muharam et. al. (2020) investigated the effect of process innovation on the financial performance of Indonesian firms and concluded that process innovation significantly and positively predicted the firm's financial performance. Supporting this result, Ukpabio et. al. (2019) asserted that process innovation significantly impacts firm performance and it remains an essential element in small and medium-sized firms. Therefore, the following hypothesis is put forward:

*H2:* Process innovation has a significant positive effect on the performance of manufacturing firms in Ethiopia.

The third variable, *marketing innovation,* refers to the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing. In other ways, it is the implementation of a new marketing concept or method that differs significantly from the enterprise's existing marketing methods and which has not been used before (OECD, 2005). Previous studies by Issau et. al. (2021), Ukpabio et. al. (2019), and Karabulut (2015) reported that market innovation significantly predicted SMEs' performance. This means that if manufacturing SMEs use market innovation through the exploitation of new markets or segments would result in higher performance. According to Muharam et. al. (2020), in a study conducted in Indonesian firms, marketing innovation was found to have a positive and significant effect on firm performance. As such, the hypothesis is developed as follows:

*H3:* Marketing innovation has a significant positive effect on the performance of manufacturing firms in Ethiopia.

The last variable that influences MSEs performance is *organizational innovation*. It refers to the application of the new organizational method in the firm's business practices such as knowledge management, new management approach, business reengineering, workplace organization or external relations that has not been previously used by the firm (OECD, 2005). Ndesaulwa and Kikula (2016) argued that organizational innovation, rather than process and product innovation, is the most vital factor for total

sales. Sharing the same view, Makó et. al. (2015) disclosed that organizational innovation could encourage and promote robust organizational learning and skills processes. In addition, Abdilahi et. al. (2017) identified organizational innovation positively and significantly influences achieving SMEs performance in terms of sales volume. Yavarzadeh et. al. (2015) also revealed that organizational innovation has a positive and significant effect on organizational performance in terms of financial, growth, customer, and internal process. However, Atalay et. al. (2013) contrasted this finding, affirming that no significant and positive link exists between organizational innovation and firm performance. Despite the inconsistent findings, the present study hypothesized that:

*H4:* Organizational innovation has a significant positive effect on the performance of manufacturing firms in Ethiopia.

### Innovation and firm performance

Several studies from the recent period of research on innovation have typically reported a positive relationship between innovation and different measures of firm performance (Gebreeyesus, 2011; Gunday et al., 2011; Issau et al., 2021; Mwangi & Namusonge, 2014). These findings consistently point to the critical need for a firm to innovate to sustain and build revenues, thereby leading to improved performance. According to Zhu et. al. (2019), MSEs need innovation to improve their performances. The assertion made by the authors was because of the conclusions reached by scholars on the innovation-performance linkage. For instance, using cross-sectional data from a sample of 378 SMEs, Abdilahi et. al. (2017) confirmed that innovation significantly affects the performance of SMEs in Hargeisa. In line with this, Otero-Neira et. al. (2009) examined the relative importance of innovation and found that different performance levels are directly and positively linked to innovation. Furthermore, Rosli and Sidek (2013) investigated the effect of innovation on the performance of Malaysian manufacturing SMEs and revealed that process innovation and product innovation positively influence firm performance.

### Review of prior empirical studies

This section reviews empirical studies of the effect of innovation on firms' performance. The relationship between innovation and firms' performance has been studied in different countries in various sectors and their empirical findings are discussed below.

Using panel data collected from 3599 manufacturing and services firms in France over 7 years, Mairesse and Robin (2009) examined the link between innovation and firm performance. The empirical finding indicates that product innovation has a significant positive effect on firm performance; however, process innovation was found to have an insignificant effect on firm performance.

Tuan et. al. (2016) examined the effects of innovation on firm performance. The study indicates that innovation is positively and significantly related to firm performance and revealed that marketing, organizational, and process innovations are more important factors affecting firm performance than product innovation. Similarly, a study on the effect of innovation elements on the performance firms in the banking sector indicated that product innovation has a positive and significant effect on profitability, while

process innovation has a positive and significant effect on both the profitability and efficiency of the banking sector (Mabrouk & Mamoghli, 2010).

The empirical evidence regarding the relationship between innovation and the performance of manufacturing firms in Rwanda found that innovation explained by R&D positively boosts manufacturing firms' financial performance (Ndemezo et al., 2018). In addition, Yavarzadeh et. al. (2015) also examined the effect of organizational innovation on the performance of the tax affairs general administration of Iran. The empirical finding of the study revealed that product, process, and organizational innovation have a positive and significant effect on organizational performance in terms of financial, growth, customer and internal process.

According to Atalay et. al. (2013), Masso and Vahter (2012), and Cassiman et. al. (2008) who studied the relationship between innovation and performance and productivity of firms in Turkey, Estonia, and Brazil, respectively, at different sectors. The result shows that product and process innovation has a significant and positive impact on firm performance. However, regarding the effect of marketing and organizational innovation, there is no significant evidence which shows its significant and positive effect on firms' performance.

Other empirical studies done on the effect of innovation elements on firm performance of profitability in Sri Lanka, and therefore, innovation capability shows a rise in the profitability of financial performance, implying a positive relationship between innovation and firm performance (Rajapathirana & Hui, 2018). Mwangi and Namusonge (2014), Rosli and Sidek (2013), Alam et. al. (2013), and Camisón and Villar-López (2014) investigated the effects of innovation types on manufacturing firms in different countries and in different aspects of firm performance have also found that there is a positive effect on firms' performance. However, Karabulut (2015) found a negative relationship between marketing innovation and firm performance.

In summary, empirical studies regarding the effect of innovation on firm performance provide mixed evidence; some studies confirmed that there exists a positive relationship between innovation and firm performance, while some studies indicated that there is no significant evidence that shows a positive relationship, and also others show that a negative relationship between some dimensions of innovation and firm performance.

From the theoretical and empirical literature reviews, it is hypothesized that innovation positively impacts firms' performance. In that, firms with a higher level of innovation activities would have better performance improvement. The conceptual framework of the current study is presented in Fig. 1.

## Data and methodology

### Description of the study area

Awi is an administrative zone in the Amhara Regional State of Ethiopia. It is located in Northwest Ethiopia between 10° 27′ and 11° 25′ N latitude and 36° 17′ and 37° 40′ E longitude. Based on the 2007 Census conducted by the Central Statistics Agency of Ethiopia, 982,942 people live in this zone (CSA, 2007). For this study, three towns (Inibara, Dangila, and Tilili) were selected purposively in the assumption that they represent all the towns of Awi zone. The significance of selecting this area stems from the fact that previous studies have not addressed the effect of innovation, particularly product,

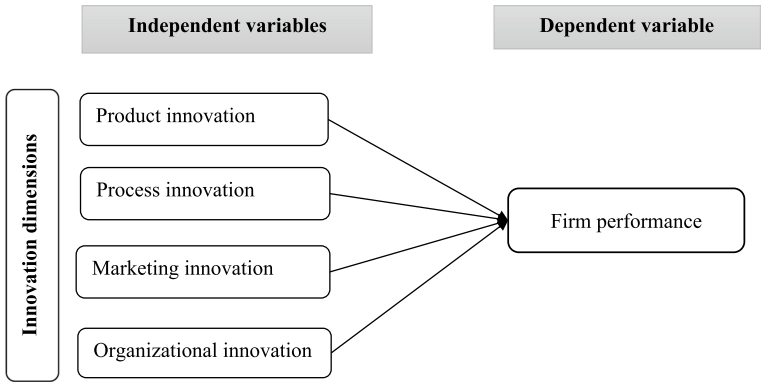


**Fig. 1** Conceptual framework of the study

process, marketing, and organizational innovation, on micro and small manufacturing firms' performance in Awi zone.

### Study design

The study adopted descriptive and explanatory designs with the arrangement of primary data collection via a cross-sectional data design followed by a mixed research approach. The major purpose of descriptive research, as the term implies, is to describe the characteristics of a population or phenomenon, while explanatory research design allows studying the relationship between independent and dependent variables. It is crucial to use explanatory design to examine the effect of innovation on firm performance.

### Data and sampling

Both primary and secondary sources of data were used for this study. The primary sources of data were administered by distributing a structured survey questionnaire to all participants in the selected micro and small manufacturing firms. Secondary data include information obtained mainly from different small and medium office reports, bulletins, and literature, which are relevant to the study to complement the survey-based analysis. There are a total of 643 micro and small manufacturing enterprises found in the selected towns of Injibara, Dangila, and Tilili according to Awi zone enterprise development office data for 2021.

The sample of this study was 247 manufacturing enterprises determined by Yamane's (1967) formula and participants were selected using a proportional random sampling technique as follows:

$$n = \frac{N}{1 + N(e)^2},$$

where $n$ = sample size; $N$ = target population; and $e$ = the acceptable sampling error at 0.05:

Hence, $n = \frac{643}{1+643(0.05)^2}$

$n = 246.59 \approx 247$.

Based on the sample size, the respondents have participated proportionally from each town, as shown in Table 1:

### Variable measurement and model specification

The choice of suitable explanatory and dependent variables and their measurement are an important issue that needs to be dealt with in specifying an empirical model.

### Explanatory variables and their measurement

In this paper, innovation orientation variables affecting the performance of manufacturing firms were accounted for. These explanatory variables of the study and their corresponding measurement are adapted from Karabulut (2015) and Gunday et. al. (2011) and discussed as follows.

a. Product innovation: product innovation was measured by seven items about the introduction of a new product, technological newness in the product, and product differentiation in the industry.
b. Process innovation: process innovation was measured by four items about the R&D orientation, the application of new technology and a new combination of materials in production.
c. Market innovation: market innovation was measured by four items, changes in packaging, design or price of a product, the application of online transactions, innovative marketing and promotion, and the ability to find new markets.
d. Organizational innovation: organizational innovation is measured by four items about quality management system, cooperation among functions, the use of intranet and database to improve knowledge sharing of the firm, and outsourcing.

### Dependent variable and its measurement

According to Love et. al. (2002), in the absence of objective measures of performance, self-assessment of firm performance by the respondents themselves is more relevant. In this paper, financial indicators such as sales, profitability, market share, sales revenue, inventory turnover and ROI (return on investment) were used as performance indicators. According to scholars, multidimensional performance measures are relevant, especially when objective performance measures are unreachable (Kellermanns et al., 2012). Therefore, the dependent variable (firm performance) was measured by seven items

**Table 1** Proportion allocation of the sample population. (Source: Awi zone enterprise development office 2021)

| Towns | Target population | Sample size (proportional) |
|---|---|---|
| Injibara | 266 | $\left(\frac{266}{643}\right) \times 247 = 102$ |
| Dangila | 238 | $\left(\frac{238}{643}\right) \times 247 = 92$ |
| Tilili | 139 | $\left(\frac{139}{643}\right) \times 247 = 53$ |
| Total | 643 | 247 |

dealing with financial and marketing performance adapted from Kaplan and Norton (1996). For each of the items, respondents were asked to compare the firm's performance against their competitors in the same industry for the last 3 years on a 5-point Likert scale ranging from 1 = very low" to 5 = very high".

Therefore, the regression model of the research is specified as follows:

$$\mathbf{Y} = \boldsymbol{a} + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \boldsymbol{e},$$

where $Y$ is the dependent variable (firm performance), $a$ is the constant (the value of $y$ when the value of all independent variables are 0), $X_1$ = product innovation, $X_2$ = process innovation, $X_3$ = market innovation, $X_4$ = organizational innovation and $\boldsymbol{e}$ = error in the study (at 0.05 random error).

$\beta_1$, $\beta_2$, $\beta_3$, and $\beta_4$ refer to the coefficient of explanatory variables, which measures the change in the mean value of $Y$, per unit change in their respective independent variables.

## Results and discussion

### Reliability and validity of measurements

The reliability test of the study instrument is another important test of sound measurement. According to Kothari (2004), a measuring instrument is reliable if it provides consistent results which an instrument measures the way each time it is used under the same conditions which the same subjects. In this study, the reliability of the constructs was checked using Cronbach's alpha coefficients. George and Mallery (2019) stated that a reliability score should fall within a range of 0.70 to 1.00 to be acceptable. The reliability test reveals that the Cronbach alpha scores of all the variables such as PrrdInn (alpha = 0.786), PrcInn (alpha = 0.913), MktInn (alpha = 0.891), OrgInn (alpha = 0.896), and FirmPrf (alpha = 0.740) ranging from 0.740 to 0.913 found to be over the recommended threshold.

Moreover, content validity was checked by getting the questionnaire reviewed by experts. In addition, the researcher conducted content validity of the questionnaire by selecting 15 respondents and adjustments were made accordingly.

### Demographic information

The demographic variables of this study for discussion were gender, firm size, sub-sector, type of ownership arrangement and firm age are summarized in Table 2.

As can be seen in Table 2, a sample of MSEs manufacturing firm owners in Awi zone included more males (79.4%) than females, more micro enterprises (60.7%) than small manufacturing enterprises, and more single (67%) than other categories. Concerning the sub-sector of the firms, 45.7% of them operate under garment and textile works followed by metal and wood engineering sub-sector with 21.9%. In comparison, 18.2% operate under agro-processing, 10.9% operate in food and beverages, 2.8% operate in traditional crafts and jewelry works, and only 1 (0.4%) was working under leather and leather products. Looking at the ownership arrangement, the majority of them (59.9%) were privately owned firms, and the majority of the firm age (64.4%) reported in the category of 4–9 years than other categories.

**Table 2** Firms demographic information. Source: Field survey (2021)

| Item | Category | Frequency | Percent |
|---|---|---|---|
| Gender of owners | Male | 196 | 79.4 |
| | Female | 51 | 20.6 |
| Firm size | Micro | 150 | 60.7 |
| | Small | 97 | 39.3 |
| Sub sector the firm operate | Metal and wood engineering | 54 | 21.9 |
| | Garment and textile works | 113 | 45.7 |
| | Leather and leather products | 1 | 0.40 |
| | Food and beverages | 27 | 10.9 |
| | Agro processing | 45 | 18.2 |
| | Traditional crafts and jewelry works | 7 | 2.8 |
| Type of ownership arrangement | Private | 148 | 59.9 |
| | Partnership | 64 | 25.9 |
| | Cooperatives | 35 | 14.2 |
| Firm age | 1–3 years | 66 | 26.7 |
| | 4–6 years | 83 | 33.6 |
| | 7–9 years | 76 | 30.8 |
| | 10 and above | 22 | 8.9 |

**Table 3** Correlation between variables. Source: Field survey (2021)

| | FirmPrf | PrdInn | PrcInn | MktInn | OrgInn |
|---|---|---|---|---|---|
| FirmPrf | | | | | |
| Pearson correlation | 1 | 0.672** | 0.591** | 0.594** | 0.568** |
| Sig. (2-tailed) | | 0.000 | 0.000 | 0.000 | 0.000 |
| *N* | 247 | 247 | 247 | 247 | 247 |
| PrdInn | | | | | |
| Pearson correlation | 0.672** | 1 | 0.189** | 0.302** | 0.326** |
| Sig. (2-tailed) | 0.000 | | 0.003 | 0.000 | 0.000 |
| *N* | 247 | 247 | 247 | 247 | 247 |
| PrcInn | | | | | |
| Pearson correlation | 0.591** | 0.189** | 1 | 0.712** | 0.523** |
| Sig. (2-tailed) | 0.000 | 0.003 | | 0.000 | 0.000 |
| *N* | 247 | 247 | 247 | 247 | 247 |
| MktInn | | | | | |
| Pearson correlation | 0.594** | 0.302** | 0.712** | 1 | 0.462** |
| Sig. (2-tailed) | 0.000 | 0.000 | 0.000 | | 0.000 |
| *N* | 247 | 247 | 247 | 247 | 247 |
| OrgInn | | | | | |
| Pearson correlation | 0.568** | 0.326** | 0.523** | 0.462** | 1 |
| Sig. (2-tailed) | 0.000 | 0.000 | 0.000 | 0.000 | |
| *N* | 247 | 247 | 247 | 247 | 247 |

**Correlation is significant at the 0.01 level (2-tailed)

### Correlation analysis of the study variables

In this study, Pearson's Correlation Coefficient was used to analyze the relationship between explanatory variables and the dependent variable. The association between variables and their statistical significance have been presented in Table 3.

Table 3 shows a significant positive correlation between the explanatory variables product innovation, process innovation, market innovation, and organizational innovation with the dependent variable, firm performance, at correlation coefficient values of 0.672, 0.591, 0.594, and 0.568 with 99% confidence level, respectively. As innovation increases, firm performance is expected to increase and vice versa.

## Regression analysis of the study

### Model diagnostics tests

Diagnosis tests were performed in this study to avoid invalid results. The diagnosis results revealed that the model has passed all the tests to undertake multiple linear regression.

### Test for linearity

Multiple linear regression models assume there is a linear relationship between the independent variables and the dependent variable. It refers to the degree to which the change in the dependent variable is related to the change in the independent variables. In this study plots of the regression residuals through SPSS software were applied to see whether the relationship is linear.

From Fig. 2, the result of the P–P plot diagram with a line of fit confirmed that a linear relationship existed between the dependent and independent variables.

### Test for normality

Test for normality indicates whether the data are well-modelled by normal distribution or not. Ideally, normality assumption is a critical role when a study is dealing with small sample size, data less than 100 observations (Gujarati et al., 2012). The test of normal

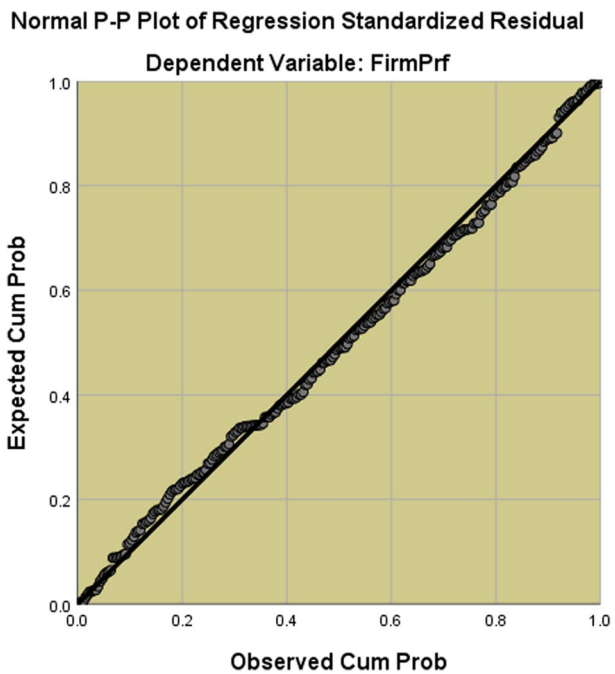


**Fig. 2** Graphical test of the linearity assumption (Source: Field survey 2021)

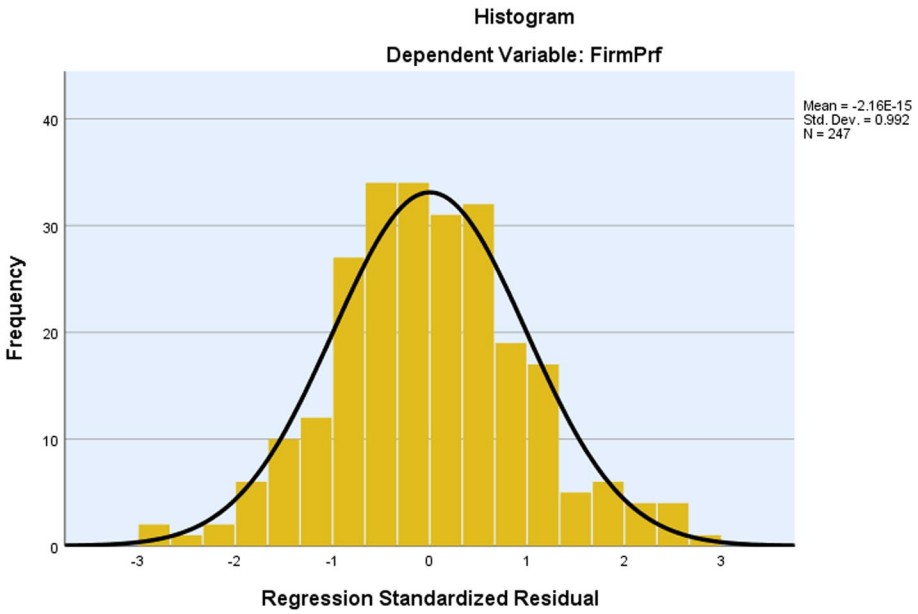


**Fig. 3** Graphical test of the normality assumption (Source: Field survey 2021)

**Table 4** Collinearity statistics. Source: Field survey (2021)

| Variables | Collinearity statistics | |
|---|---|---|
| | Tolerance | VIF |
| PrdInn | 0.853 | 1.173 |
| PrcInn | 0.439 | 2.276 |
| MktInn | 0.460 | 2.172 |
| OrgInn | 0.668 | 1.497 |

distribution could be checked by the graphical (histogram and dot plot) method of tests. Even though the normality assumption is not a threat, since the observation the study is large enough, 247, the researcher tested it using a histogram.

As shown in Fig. 3, the histogram shows the standardized residuals are bell-shaped, implying the residuals are normally distributed. Thus, no violations of the assumption normally distributed error term. In addition, the study checked for skewness and kurtosis to determine whether the data were normally distributed. According to Harrington (2009), variables with skew index absolute value greater than 3 and kurtosis index absolute value greater 10 has problematic level of skewness and kurtosis. For the current study, no variables have a problematic skewness and kurtosis.

### Test of multicollinearity

The test of multicollinearity is an indication of a linear relationship between the independent variables (Gujarati et al., 2012). Variable Inflation Factor (VIF) technique was used to measure the reciprocal of the complement of the inter-correlation among the predictors. As a general rule, variables with VIF value of greater than 10 indicate the possible existence of multicollinearity problems. An examination of VIF for variables in this study showed that multicollinearity was not a problem (Table 4).

### Test of independence of residuals

Multiple linear regression models assume the residuals are independent of one another. The Durbin–Watson statistic is used to test for serial correlation among the residuals. The value of the Durbin–Watson statistic ranges from 0 to 4. As a general rule, the residuals are not correlated if the Durbin–Watson statistic is approximately 2, and an acceptable range is 1.50–2.50. Therefore, Durbin–Watson statistic was applied to test the assumption (Table 5). The data in this study were free from the problem of autocorrelation, since the Durbin–Watson statistic is closer to 2.0.

The model summary in Table 6 shows that explanatory variables (PrdInn, PrcInn, MktInn, and OrgInn) can together accounts in explaining the dependent variable firm performance by 70.4%. The remaining 29.6% of the variation in overall firm performance could be explained by other variables not incorporated in the current study.

The analysis of variance (ANOVA) analysis in Table 7 shows the estimation results for $F$ test of the overall model were statistically significant between the explanatory variables (PrdInn, PrcInn, MktInn, and OrgInn) and dependent variable (FirmPrf). The value of the $F$ test was ($F = 146.954$, $df1 = 4$, $p \leq 0.05$) indication level. $F$ values imply that the model and data are well-fit in explaining the dependent variable.

Table 8 presents the multiple regression analysis findings testing the effects of explanatory variables (PrdInn, PrcInn, MktInn, and OrgInn) on firm performance. According to the regression coefficients, product innovation has a strong positive effect on the dependent variable firm performance. The beta value of product innovation is 0.514 (at $p = 0.000$) or even strictly $p < 0.01$, implying the value is highly significant. Process innovation was the next variable with high beta coefficient, the second most contributing factor to the dependent variable, firm performance, with a beta value of 0.299 (at $p = 0.000$). In addition, based on standardized beta coefficient value, organizational

**Table 5** Test of independence of residuals. Source: Field survey (2021)

| Durbin–Watson |
|---|
| 2.010 |

**Table 6** Model summary. Source: Field survey (2021)

| Model | *R* | *R* square | Adjusted *R* square | Std. error of the estimate | Change statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | *R* square change | *F* change | *df*1 | *df*2 | Sig. *F* change |
| 1 | 0.842[a] | 0.708 | 0.704 | 0.38613 | 0.708 | 146.954 | 4 | 242 | 0.000 |

[a] Predictors: (constant), OrgInn, PrdInn, MktInn, PrcInn

[b] Dependent variable: FirmPrf

**Table 7** ANOVA. Source: Field survey (2021)

| Model | | Sum of squares | *df* | Mean square | *F* | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 87.641 | 4 | 21.910 | 146.954 | 0.000[b] |
| | Residual | 36.081 | 242 | 0.149 | | |
| | Total | 123.722 | 246 | | | |

[a] Dependent variable: FirmPrf

[b] Predictors: (constant), OrgInn, PrdInn, MktInn, PrcInn

**Table 8** Coefficient of the study variables in the model. Source: Field survey (2021)

| Model | | Unstandardized coefficients | | Standardized coefficients | *t* | Sig. |
|---|---|---|---|---|---|---|
| | | *B* | Std. error | Beta | | |
| 1 | (Constant) | 0.389 | 0.143 | | 2.726 | 0.007 |
| | PrdInn | 0.403 | 0.029 | 0.514 | 13.661 | 0.000 |
| | PrcInn | 0.260 | 0.046 | 0.299 | 5.715 | 0.000 |
| | MktInn | 0.116 | 0.041 | 0.143 | 2.800 | 0.006 |
| | OrgInn | 0.130 | 0.031 | 0.178 | 4.200 | 0.000 |

[a] Dependent variable: FirmPrf

**Table 9** Study hypothesis testing. Source: Field survey (2021)

| The proposed hypothesis of the study | Decision |
|---|---|
| H1: Product innovation has a significant positive effect on the performance of manufacturing firms in the study area | Supported |
| H2: Process innovation has a significant positive effect on the performance of manufacturing firms in the study area | Supported |
| H3: Marketing innovation has a significant positive effect on the performance of manufacturing firms in the study area | Supported |
| H4: Organizational innovation has a significant positive effect on the performance of manufacturing firms in the study area | Supported |

innovation and market innovation have a significant positive effect on firm performance at a beta value of 0.178 and 0.143, respectively. Finally, the regression coefficient entails an increase in the current average firm performance that was affected by a unit increase in innovation factors by their respective beta value, keeping the effect of one variable on the other constant.

### Hypothesis testing

The proposed hypothesis for the current study was tested based on the study's correlation and regression analysis results with 95 percent confidence level and $p$ value to test whether the hypothesis is accepted or rejected. The results of the proposed hypothesis of the study are presented in Table 9.

## Discussion

This study aimed to explore the effect of innovation orientation on firm performance of micro and small manufacturing enterprises. Furthermore, concerning the effect of the four independent variables of innovation (PrdInn, PrcInn, MktInn and OrgInn) on the firm performance, the findings reveal that all these variable jointly accounts for 70.4% of the variance in the dependent variable (FirmPrf), While the remaining 29.6% of the variation in overall firm performance could be explained by other variables not incorporated in the current study.

The regression model results indicated that product innovation (coefficient = 0.514; $p = 0.000$) and process innovation (coefficient = 0.299, $p = 0.000$), are leading factors affecting the firm performance of MSEs, as first and second, respectively. In the manufacturing sector, product and process innovation are the critical

variables that played a significant role in determining a firm's performance. According to scholars, the reason behind this is that product innovation helps firms take advantage of being first to satisfy customers' needs. This means that quality products enhance the firms' competitive advantage, thereby contributing to firms' performance. This finding supports the work of Oduro (2019), Rosli and Sidek (2013), Atalay et. al. (2013) who reported a positive relationship between product innovation and the performance of firms. Similarly, process innovation allows a firm to improve performance by eliminating waste as it enables firms to attain greater efficiency and grow quality products (Lendel et al., 2015; Un & Asakawa, 2015). The findings support prior studies that revealed process innovation had a significant positive effect on firm performance (Atalay et al., 2013; Mwangi & Namusonge, 2014; Oduro, 2019). In contrast to this finding, Issau et. al. (2021) revealed that the relationship between process and product innovation with firm performance was non-significant, which was not supported by the current study.

The study also indicated that organizational innovation had a significant positive effect on firm performance, with a coefficient of 0.178. This finding was consistent with the views of Ndesaulwa and Kikula (2016) and Makó et. al. (2015) who identified organizational innovation could encourage robust organizational learning and skills processes which in turn influences the performance of MSEs. On the other hand, this finding was inconsistent with the work of Atalay et. al. (2013), who argued that no significant and positive link exists between organizational innovation and firm performance. Furthermore, marketing innovation significantly and positively affected firm performance with a coefficient of 0.143. This means that if manufacturing MSEs use market innovation through the exploitation of new markets or segments would result in higher performance. This result is similar to the finding of Issau et. al. (2021), Ukpabio et. al. (2019), Oduro (2019), and Karabulut (2015). Overall, the study found a strong relationship between the dependent and independent variables.

## Conclusion

In this study, the empirical analysis of innovation's effect on the performance of micro and small manufacturing firms was conducted using cross-sectional primary data collected from 247 micro and small manufacturing firms in selected towns of Awi zone, Ethiopia. The results of multiple regression analysis revealed that firm innovation was statistically significant in explaining the performance of micro and small manufacturing firms in Injibara, Dangila, and Tilili towns. The result of the study also shows that product, process, marketing, and organizational innovation were positively and significantly related to firm performance, while product innovation were found to have a strong positive effect on the dependent variable firm performance followed by process and organizational innovation, respectively. However, a weak statistical relationship was reported between marketing innovation and the performance of manufacturing firms than other variables. Hence, firms which have a strong orientation towards product, process organizational, and marketing innovation have better performance in manufacturing firms in the study area.

### Theoretical implications

From the theoretical point of view, this study contributes to the literature on the nexus between innovation and the performance of micro and small manufacturing enterprises by investigating the influence of product, process, marketing, and organizational innovation on the performance of firms. Despite the development of micro and small enterprise sectors and their contribution to the national economy, the effect of innovation on micro and small manufacturing firms' performance has not been studied sufficiently in Ethiopia in general and Awi zone in particular. Such findings are, therefore, important, because they equip policymakers and owners of MSEs with applied knowledge of how innovation affects firms' performance. In addition, this study provides valuable insights in reconciling seemingly inconsistent and mixed findings in previous studies.

### Managerial implications

These findings have some implications for MSEs owners and managers. The knowledge of the association between innovation and firm performance offers practical insights for the proper management of firms. It can be derived from this study that firms should put special emphasis on product and process innovations, as these types of innovation are found to be essential instruments for achieving sustainable competitive power. Innovative MSEs would have better opportunities of thriving in the fierce competition, allowing them to diversify their products or services and adapt to the changing consumer needs.

### Limitations and ideas for future research

A future line of investigation could be carried out by acquiring secondary data sources as a performance indicator. This study used cross-sectional primary data to measure firm performance, and as such, the absence of objective performance measures could be a limitation. However, it should be noted that scholars agree that self-assessment of performance is relevant, especially when secondary data are unreachable. Further studies could also be conducted by incorporating several mediators and moderator variables and interlinking innovation types with micro and small manufacturing firms' performance.

## Appendix 1. Variables and their measurements

| S/N | Product innovation measures | Response options | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | We developed a new model of a product which is manufactured in our firm to use for different purposes | | | | | |
| 2 | We were manufacturing our product from a different material before we are using a new material now | | | | | |
| 3 | We have at least one product which is innovated and manufactured in our firm | | | | | |
| 4 | We launched at least one product which we manufactured in a market | | | | | |
| 5 | Our firm has at least one patent of products which we manufactured | | | | | |
| 6 | We improve an existing product in a sector and launch to a market as a new product | | | | | |

| S/N | Product innovation measures | Response options | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| 7 | Tools and equipment which can be considered as high technology are used for products which are manufactured in our firm | | | | | |
| | **Process innovation measures** | | | | | |
| 1 | We actively research and brainstorm on better methods of conducting our business | | | | | |
| 2 | We explore non-traditional and creative ways of doing business | | | | | |
| 3 | There are changes in manufacturing methods in our firm compared to earlier years | | | | | |
| 4 | Costs are controlled during the production process in our firm and savings are achieved by getting rid of unnecessary ones | | | | | |
| | **Market innovation measures** | | | | | |
| 1 | There are changes in packaging, design or price of a product to increase sales in our firm | | | | | |
| 2 | There are new methods to promote products in our firm | | | | | |
| 3 | Marketing method which was used before in our firm was different than the one which is used now | | | | | |
| 4 | We have launched an online payment system for customers in our firm | | | | | |
| | **Organizational innovation measures** | | | | | |
| 1 | There is intranet, database training etc. practices to improve knowledge share in our firm | | | | | |
| 2 | Outsourcing (purchasing, recruiting, technological support, consulting etc.) which has not been used before is used recently in our firm | | | | | |
| 3 | Cooperation among functions provide time and cost benefits in our firm | | | | | |
| 4 | Renewing the production and quality management systems in our firm | | | | | |
| | **Items on firm's performance measures** | | | | | |
| 1 | Market share | | | | | |
| 2 | Sales revenues of new products | | | | | |
| 3 | Profitability | | | | | |
| 4 | Productivity | | | | | |
| 5 | ROI (return on investment) | | | | | |
| 6 | Inventory turnover | | | | | |
| 7 | New customers | | | | | |

**Abbreviations**

| | |
|---|---|
| MSEs | Micro and small enterprises |
| PrdInn | Product innovation |
| PrsInn | Process innovation |
| MktInn | Marketing innovation |
| OrgInn | Organizational innovation |
| FirmPrf | Firm performance |

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**Contribution/originality**

This study contributes to the existing literature by investigating the effect of product, process, marketing, and organizational innovation on the performance of micro and small manufacturing firms in Ethiopia, specifically in Awi administrative zone.

**Author contributions**

The author undertook this research paper independently. The author read and approved the final manuscript.

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**Availability of data and materials**
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## Declarations

**Competing interests**
The authors declare no potential conflict of interest.

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