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Research Paper

Impact of Product and Process Innovation Practices on Competitiveness of Manufacturing Enterprises in Ethiopia Mediated by Competitive Advantage

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Abstract

In general, innovation is considered a success element behind growth and competitiveness of manufacturing firms. This study investigated the impact of product and process innovation capability practices on competitiveness of manufacturing enterprises in Ethiopia. It also intended to test whether competitive advantage mediated the relationship between product innovation and competitiveness as well as process innovation and competitiveness. Quantitative research approach was used to collect questionnaire based data from 300 randomly selected manufacturing firms in Ethiopia; out of these, 270 were correctly completed and returned. Structural equation modeling with AMOS v23 was used for data analysis. Measurement model's validation was done using confirmatory factor analysis in which all of the variables were assessed for convergent, composite and discriminant validity tests. The findings indicated that both product and process innovations had a significant direct effect on manufacturing firm's competitiveness of manufacturing firms in Ethiopia. Moreover, both product and process innovations had a significant indirect effect on competitiveness through competitive advantage as the mediating variable. Competitive advantage as a mediating variable had a significant mediating role between product innovation and competitiveness, and between process innovation and competitiveness. These findings have substantial implications for manufacturing firms in Ethiopia to gear their energies towards improvement of products offered to market as well as those processes intended to produce quality products which outshines the internal and external competitions in the market. Hence, Ethiopian businesses are recommended to invest more in product and process innovations to build competitive advantage and competitiveness.

1. Introduction

Ethiopia is taking multidimensional steps to radically reduce poverty and it is putting a number of development plans and strategies into action in order to become a middle-income nation by 2025 (Tadesse & Henok, 2023). Hence, the government is currently concentrating on growing the manufacturing sector because of its potential to create a significant number of jobs, to replace imports, and to save foreign exchange - the largest economic issue. Better loan availability, the creation of industry parks, tax breaks, and infrastructure expenditures are some of the incentives offered to attract domestic and foreign investors to work in the manufacturing sector, particularly paying attention to businesses that export manufactured goods (Kefyalew, 2023).The majority of industries in Ethiopian, especially those in the manufacturing sector, are distinguished by their deficiency in market-driven strategies (Abebe, 2019) and thus focus was placed on

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improving their ability to maintain competitiveness through high-quality product development to operate at the necessary level. Ethiopia's manufacturing industry faces intense competition as a result of the introduction of several small-scale manufacturers, and a major issue facing businesses is their misalignment with the market (Kaleb & Bizuayehu, 2020).

Thus, Ethiopian businesses must build their innovative capacities in order to seize market opportunities and remain competitive in both domestic and international markets (Zenebech, 2017). development policymakers and academicians in Ethiopia also believe that enterprise innovation is the foundation for industrial development (Megersa et al., 2018) and creating and developing new, marketable products is a crucial strategic advantage for an organization's survival and capacity to outperform its rivals (Beyene et al., 2016). To improve firm-level innovation practices, Ethiopia must encourage enterprises' involvement in knowledge production (Mezid & Mesele, 2022). Innovation would be an approach to effectively utilize resources and processes and to compete on the local market, given the abundance of imported goods on the Ethiopian market makes sense to innovate using a quality-focused approach (Voeten & Beyene, 2018). There are four types of innovation; namely, product, process, market, and organizational innovation (Sigalat-Signes et al., 2020). While Product innovation is taken as a business endeavors to develop, refine, and produce new products (Ashrafi & Ravasan, 2018), process innovation is the degree to which organizations improve their production and manufacturing procedures and techniques to produce high quality products.

Formal manufacturing firms in Ethiopia are subject to informal competition, highlighting how detrimental it is to the performance of industrial enterprises (Kefyalew, 2023) necessitating the need for innovative products. Therefore, improving the products quality with market driven innovation is required in Ethiopia, as customers will have choice over multitude of goods domestically produced and imported.

The importance of product and process innovations for competitive advantage and competitiveness was researched by many previous studies. If a business effectively expands and integrates its resources and competencies, it can gain a competitive advantage (Novitasari & Agustia, 2023). Increasing market share and reducing unit costs are important drivers of innovation (Wakeford et al., 2017). Competitiveness has been construed as the ability of a business to produce a good or service more effectively than its competitors (Solorzano & Olives, 2022). Competitiveness leads to profitable trading where maintaining and expanding market share is a result of profitable commerce that leads to competitiveness (Getnet & Admit, 2006). Productivity, market share, profitability, efficiency, product variety, value creation, and customer satisfaction are just a few of the numerous interconnected firm factors that determine competitiveness (Kiveu et al., 2019) and most of these indicators were used in this study in measuring competitiveness at firm level. In addition, Flak & Glod (2020) stated that competitiveness is a relative term and multidimensional in nature as there is no absolute scale of measurement for all situations and it might indicate the relationship of firms in the market. Therefore, even if competition is the driving force behind growth, a number of empirical studies have demonstrated that formal firms' performance metrics, such as productivity and innovation, are negatively impacted by competition from informal enterprises in Ethiopia (Kefyalew, 2023).

For this, improving products quality through improved innovation oriented products and processes would lead large and medium scale manufacturing firms in Ethiopia to face and stand the threat of competition. Many empirical studies revealed a very significant effect of product and process innovation of firms on performance and competitiveness. Samuel (2023) and Wondifraw et al. (2022) found that product, process, marketing and organizational innovation were positively and significantly related to firm performance. Su (2023) also stated that product innovation has a direct effect on a firm’s performance. Wondwossen (2018) observed that product, process and market innovations give the Small and Medium Enterprises a competitive edge in the market. Furthermore, Abebe & Abebaw (2023) underlined that innovation is an essential element of a successful business as creative economy is often regarded as essential to the survival and competitiveness of businesses, in transitional economies and is

prerequisite for attaining economic and social prosperity.

Alinda et al. (2024) found strong correlation between process innovation and sustainability practices in Uganda. Specifically, Canh et al. (2019) concludes that product and process innovation are beneficial to firm performance in terms of market share in Vietnam. Turning to the mediation role of competitive advantage between product and process innovations and firms' performance, empirical review reveals disparities in the context, methodology and geography. First, while some studies (Yang et al., 2018; Novitasari & Agustia, 2023; Yuliantari & Pramuki, 2022) asserted that competitive advantage has a mediation role between innovation capability variables and firms competitiveness, some others (Wahyuni & Sara 2020; Insee & Suttipun, 2023) produced different results that necessitate further research. In addition to the disagreement gaps, the studies in Ethiopia have contextual gaps, where majority of those studies in Ethiopia focused on a single or few firms with fewer sample size. The mediation role of competitive advantage was not examined in any of the prior studies on innovation and firm performance in Ethiopia and elsewhere, showing the gap in study.

Hence, the main objective of this study was to examine the product and process innovation capability practices in the manufacturing enterprises of Ethiopia and their effect on competitive advantage that would in turn enhance firms' competitiveness in terms of profitability, market share growth, sales volume, and productivity using structural equation modeling. The focus on the manufacturing sector was justified with the fact that majority of firms in the manufacturing sector practice innovations compared to other sectors. In this study, product and process innovations were taken as exogenous latent variables; competitive advantage as a mediating variable; and competitiveness was taken as an endogenous latent variable.

2. Materials and Methods

2.1. Research design

Based on the empirical literature review, to assess the degree to which product and process innovations indirectly affects competitiveness in terms of profitability, market share, sales volume and productivity, seven hypotheses were formulated.

Ha1: Product innovation significantly affects competitiveness of manufacturing firms

Ha2: Product innovation significantly affects competitive advantage

Ha3: Process innovation significantly affects competitiveness

Ha4: Process innovation significantly affects competitive advantage

Ha5: Competitive advantage significantly affects competitiveness

Ha6: Competitive advantage significantly mediates the relationship between product innovation and competitiveness

Ha7: Competitive advantage significantly mediates the relationship between process innovation and competitiveness

To test the formulated hypotheses, this study used cross sectional research design which assumes a particular period across all different firms in Ethiopia. This also gave equal opportunity, in data collection from the manufacturing firms considered in this study at specific time, as it reduces biasness. The data used for this study was collected in 2023.

2.2. Population and sample size

The target firms for this study are medium- and large-scale manufacturing sector in Ethiopia. The reason for focusing on large and medium sized firm is due to the nature of the study objectives and the closeness of those firms to innovation and competitiveness compared to those firms with less size as referenced from (Megersa et al., 2018; Mesfin et al., 2022). Manufacturing company that employs between 10 and 51 people was categorized as medium-scale, and the one employing >51 was categorized as large-scale (CSA, 2018). Approximately 3,687 large and medium-sized manufacturing enterprises are currently legally registered, of which 3,500 are operating (EIC, 2023). Using the standard sample size determination (Kothari, 2004), the sample size was found to be 300. A list of the companies considered for this study was sourced from the Ethiopian investment commission to form the sample frame.

Owing to the dense population of manufacturing companies in Addis Ababa and Sheger City, a stratified random sampling technique was used to distribute paper

copies of questionnaires to the 300 manufacturing companies. The target respondents of the questionnaires were higher officials of the manufacturing firms. A pilot test was conducted to assess the measurement items of the questionnaires for clarity, comprehension, and suitability. The feedback from the 20 participants who were involved in the pilot test helped to refine the questionnaire.

2.3. Data measurement instrument

Measurements of all research variables were made with approved tools. A structured questionnaire was used to measure product and process innovations (OECD, 2018). Likert scale, with items (1) = Lack of innovation implementation to (5) = Innovative original goods and processes, was used for the study. Competitiveness was represented by four indicators of profitability, sales volume, market share growth, and productivity of firms compared with other similar firms in the industry. For instance, competitiveness/business performance was represented by market share and profitability by Kiveu et al. (2019) and market share, profit level, sales volume and return on investment by Singh et al. (2019) when a cross sectional study was done. To measure competitive advantage, 16 items, covering cost quality, delivery reliability, and variety with multiple scale ratings ranging from 1= strongly disagree to 5= strongly agree were used to quantify competitive advantage as a mediating variable (Ferreira et al., 2021).

2.4. Data analysis methods

Descriptive statistics was used to illustrate the characteristics of the study variables; whereas structural equation modeling was used to explore the relationship between complex models (Dash & Paul, 2021). Specifically, the covariance based structural equation modeling was applied in the current study as it suits testing the formulated hypotheses with the data at hand. Hence, the formulated hypotheses based on theoretical relationships among factors were tested to the data collected to either confirm or reject those relationships.

Furthermore in testing whether the proposed factors represent the indicator, confirmatory factor analysis (CFA) was applied for the measurement model. Application of confirmatory factor analysis indicates that there are at least some theory available indicating the relationship between the hypothesis that the proposed theoretical relationship among the observed and latent variables exist and the researchers were expected to test this relationship (Hair et al., 2020). In contrast to exploratory factor analysis (EFA), it uses actual data to validate the factor specification that is already available. In order to validate the measurement for CFA, model fit was assessed. Following model fit, the latent variable path models were evaluated. In path analysis, a structural model explains the causal relationship between the substantive independent variables and the dependent variables; in factor analysis, a measurement model explains the relationship between the observed indicator variables and the latent variables, where the latent variables are thought to be responsible for the responses on the observed variables (Zyphur et al., 2023).

In regards to model fitness assessment, commonly cited goodness of fit indicators of a model were used (GOF) (Mustafa et al., 2020; Savalei, 2021). Thus, (1) *Chi-squared ($\chi 2$*) goodness of fit test was used to test the null hypothesis that a model-implied covariance matrix is not statistically different from the observed matrix and, a non-significant $\chi 2$ suggests a satisfactory model fit and fails to reject the null hypothesis. (2) *Root mean square error of approximation (RMSAE*) indicates good fit values of 0.08 and below and any value over 0.10 denotes a bad fit. (3) *Comparative fit index (CFI)* was used to assess the fit between the covariance matrix inferred by the model and the matrix predicted by the baseline mode; values greater than or equal to 0.95 often imply good fit. (4) *The Goodness of Fit (GFI)* measures the degree to which the proposed model outperforms a null model that serves as a baseline model, where 1 represents an ideal match and 0 represents an incredibly poor fit. (5) Similar to the GFI, *adjusted goodness of fit indices (AGFI)* is regarded as indicative of well-fitting model with values of 0.90 or higher. (6) *The Tucker and Lewis Index (TLI)* was used to evaluate an estimated model's fit in comparison to a different baseline model; any value above 0.90 is typically linked to a well-fitting model.

3. Results and Discussion

3.1. Existing status of the manufacturing firms in product and process innovation

Descriptive statistics was employed to elucidate the general characteristics of the respondents and study variables. Data was collected from 10 different types of industries in the manufacturing sector (Table 1). Food and beverage manufacturing factories represent the highest percentage and the lowest in number paper and paper products manufacturer. Of the distributed 270 questionnaire, 92 % response rate was secured. All firms were required to have been in operation for three years or more in order to be eligible to participate in the research as a prerequisite for innovation survey data collection (OECD, 2018).

Based on the demographic characteristics of the respondents, just over two-third of the respondents are men and more than 90 % of the respondents have at least bachelor degree. The respondents comprised of operation managers, general managers, marketing managers, production engineers, assistant production and quality control.

Table 2 displays the comparison of manufacturing firms in Ethiopia in terms of their enterprise size and innovation activity implementation. Compared to medium enterprises, both product and process innovation processes are predominantly implemented by larger affirmed that innovativeness increases with firm size in the last three years (121 of large firms have implemented product innovations compared to 78 firms) which is also similar with process innovation. The result was also in line with previous findings on the fact that larger firms innovate more compared to smaller ones (Mulu et al., 2018; Kiveu et al., 2019; Samuel, 2023; Mesfin et al., 2022).

Considering the specific firms in the manufacturing sector, of the total firms that introduced product innovation in 2021- 2023, 23.2% were in the food and beverage industry, followed by textile and wearing apparel with 17.6%.

Table 1: Industry type and demographic characteristics

Category	Sub-category	Frequency	Percent
Manufacturing category	Basic and Fabricated Metal Products	20	7.4
	Other nonmetallic mineral products	39	14.4
	Wood and wood products	7	2.6
	Chemical and chemical products	26	9.6
	Food and beverage products	52	19.3
	Furniture	38	14.1
	Leather and leather products	12	4.4
	Paper and paper products	3	1.1
	Rubber and plastic products	35	13.0
	Textile	38	14.1
Sex of Respondents'	Male	183	67.8
	Female	87	32.2
Educational background	Diploma	26	9.6
	Bachelor's degree	154	57.1
	Masters	87	32.2
	Above masters	3	1.1
Position in the enterprise	General manager	52	19.3
	Operation manager	74	27.4
	Production engineer	45	16.7
	Assistant production	33	12.2
	Marketing manager	48	17.8
	Quality control	18	6.7

Table 2: Enterprise size versus product and process innovation behavior

Innovation behavior	Enterprise size		
	Medium	**Large**	**Total**
Product innovation introduced	78	121	199
Product innovation not introduced	53	18	71
Process innovation introduced	77	113	190
Process innovation not introduced	54	26	80

Rubber and plastic products, furniture, nonmetallic mineral products manufacturers constitute 13, 12 and 12.5 %, respectively. In regards to process innovation, firm in the textile and wearing apparel manufacturers introduced improvements and renewal to their production methods and systems (18 %); while firms in food and beverage industry constitute 16 % of the total. This finding was also similar with the study done by Wakeford et al. (2017), in which firms in leather industry were found to engage in process and products innovations more than others.

Competitiveness was a latent dependent variable measured with profitability, sales growth, market share and productivity, each measured with five point Likert scale questions in which 1 represented the worst in the industry and 5 the best. The respondents were asked to rate their organizations competitiveness in terms of the variables relative to all other similar product providers. The values of the competitiveness indicators were found to be 3.57, 3.55, 3.47 and 3.33 for profitability, sales volume, market share growth and productivity, respectively. Thus, firms in Ethiopia are on average competitiveness level with all other competitors taken from average score of the sampled respondents' data.

3.2. Reliability and validity

This study used both internal consistency and composite reliability to test reliability. Cronbach's alpha was seen as the most reliable indicator of internal consistency, and a value of ≥ 0.70 deemed adequate (Hair et al., 2020) and the result in Table 3 is consistent with this. Similarly, composite reliability result was calculated from confirmatory factor analysis and all of the values were above 0.7, which is recommended threshold. Convergent validity, which explains the variance of its indicators, was determined based on factor loadings, by utilizing the average variance extracted (AVE) (Sujati et al., 2020*)* and loadings must be >0.5 with a significant corresponding p value ($p<0.05$). Based on the results of the confirmatory factor analysis results (Table 3), the convergent validity of this study shows that all factor loadings and the AVE are above 0.5 confirming the absence of any issues with convergent validity.

Another measure of validity is discriminant validity which measures how distinct a given variable is from others in measuring a given latent variable and can be assured if the correlation between two factors in the relationship is less than AVE square or the larger the square root of AVE compared to factor correlations (Sujati et al., 2020). In the current study, the square root of AVE that was calculated earlier in this section in Table 4 was placed diagonally in bolded font. This result was compared against the inter-factor correlation within that column for discriminant validity test. From Table 4, the square root of AVE was much greater than the correlations in that column enduring absence of discriminant validity issue in the study. For instance, the square root of AVE for firms' competitiveness was 0.89 and this value is greater than the Pearson's correlation value that competitiveness has with other variables in that column.

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Table 3: Reliability and validity test results

Variables	Item-total correlation	Cronbach's alpha	Composite reliability	Av. variance extracted (AVE)	Square root of AVE
Product Innovation	0.629**	0.821	0.866	0.564	0.75
Process Innovation	0.791**	0.817	0.830	0.575	0.76
Competitive advantage	0.523**	0.902	0.923	0.844	0.92
Competitiveness	0.423**	0.905	0.930	0.800	0.89

** Significant at 0.01

Table 4: Discriminant validity using cross correlation and square root of AVE

Variables	Competitiveness	Competitive advantage	Product innovation	Process innovation
Competitiveness	**0.890**			
Competitive advantage	0.540**	**0.920**		
Product Innovation	0.521	0.536	**0.750**	
Process Innovation	0.520**	0.456	0.489*	**0.760**

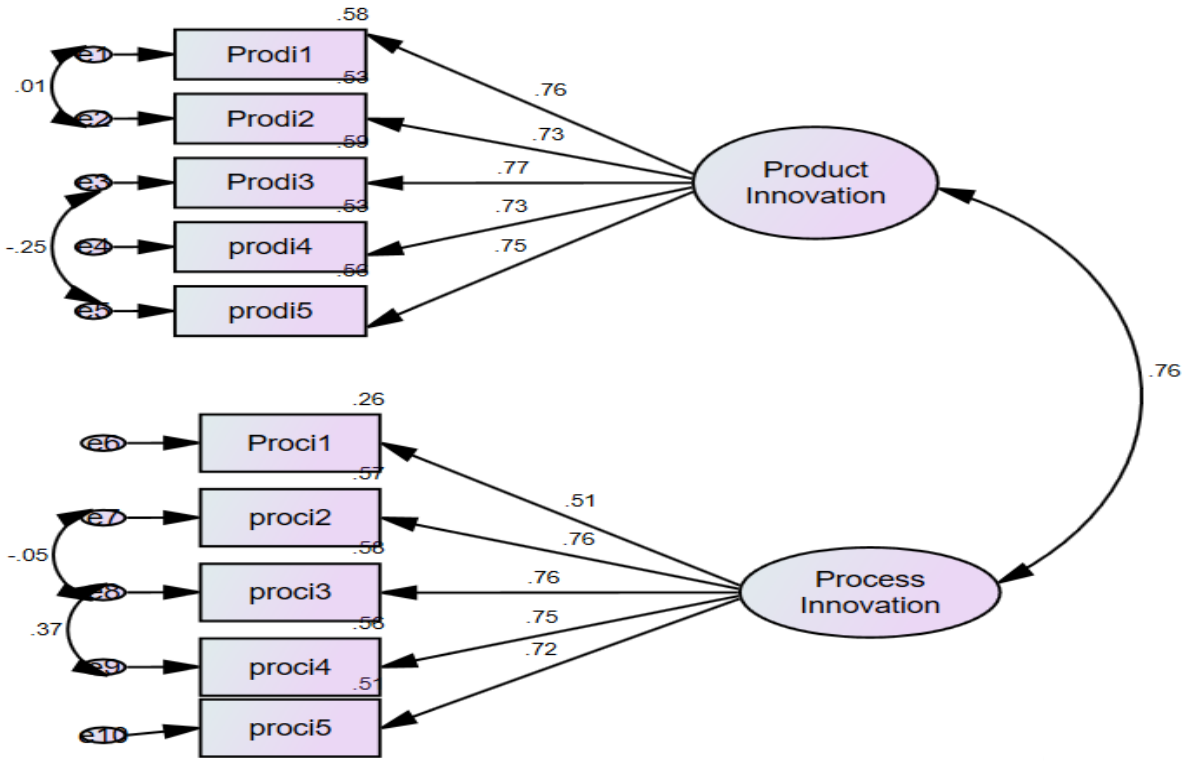
** Significant at 0.01; * significant 0.05

3.3. Assumption for structural equation modeling

To test normality, the values of Skewness and Kurtosis were used to check if the data matched the requirements for multivariate normality. Thus, it was confirmed that the study's variables had values normally distributed and which fall in the suggested ranges of ±1.96 and ±7, respectively (Hair et al., 2014). Moreover, different methods, such as the variance inflation factor, tolerance and inter factor association, were applied to detect the presence of multicollinearity. Hair et al. (2020) stated that tolerance <0.25 and variance inflation factor ≥ 5 are conditions that dictate presence of multi-collinearity. Consequently, the study's multi-co linearity test results confirmed absence of multi-co-linearity, as evidenced by the correlation matrix of below 0.80, VIF <3, and tolerance >0.25. Regarding the sufficiency of sample size in applying the structural equation modeling, the minimum required is 200 (Hair et al., 2018); thus, the 270 sample size of this study adequate for the analysis. Furthermore, the Kaiser Mayor Olkin (KMO) value of 0.907 significantly above the lowest threshold for factor analysis of 0.50. Besides, for a Chi2 = 2244 and DF=66, P <0.001 is significantly different from zero.

3.4. Confirmatory factor analysis for model measurement

Two steps were followed to validate the structural equation modeling, with confirmatory factor analysis (CFA) done first, followed by the structural part (Sarstedt et al., 2022). The independent variables in this study were product and process innovation practices, with respective indicators each having five items to be measured with (Figure 1). All measurement Model goodness of fit (GOF) test values showed satisfactory results, compared to the thresholds. Similarly, based on the CTA result displayed in Figure 2, the dependent variable of this study was validated. All factor loadings were significantly above 0.5 and the model was also well fit with all indices. Model fit was then tested for the mediating variable which is competitive advantage with its four indicators all achieving factor loadings above the required level fulfilling the criteria. Figure 3 gives the measurement model result for competitive advantage. Table 5 presents the values of the model fit indices for product and process innovations (dependent variables), firm competitiveness (dependent variable) and competitive advantage.



Fiure 1: Measurement model for the independent variables

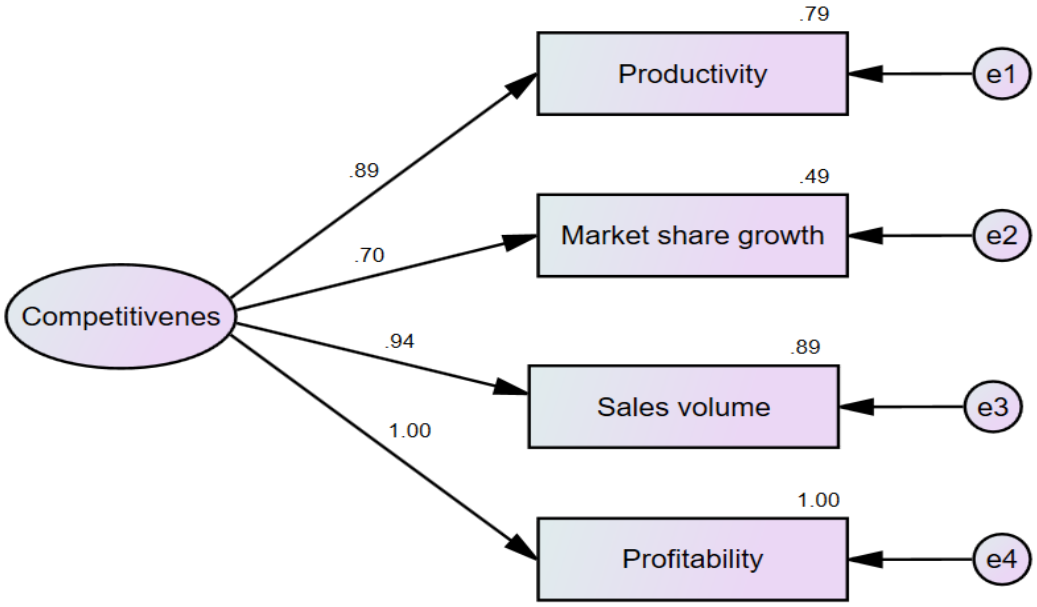


Figure 2: Measurement model for firm competitiveness

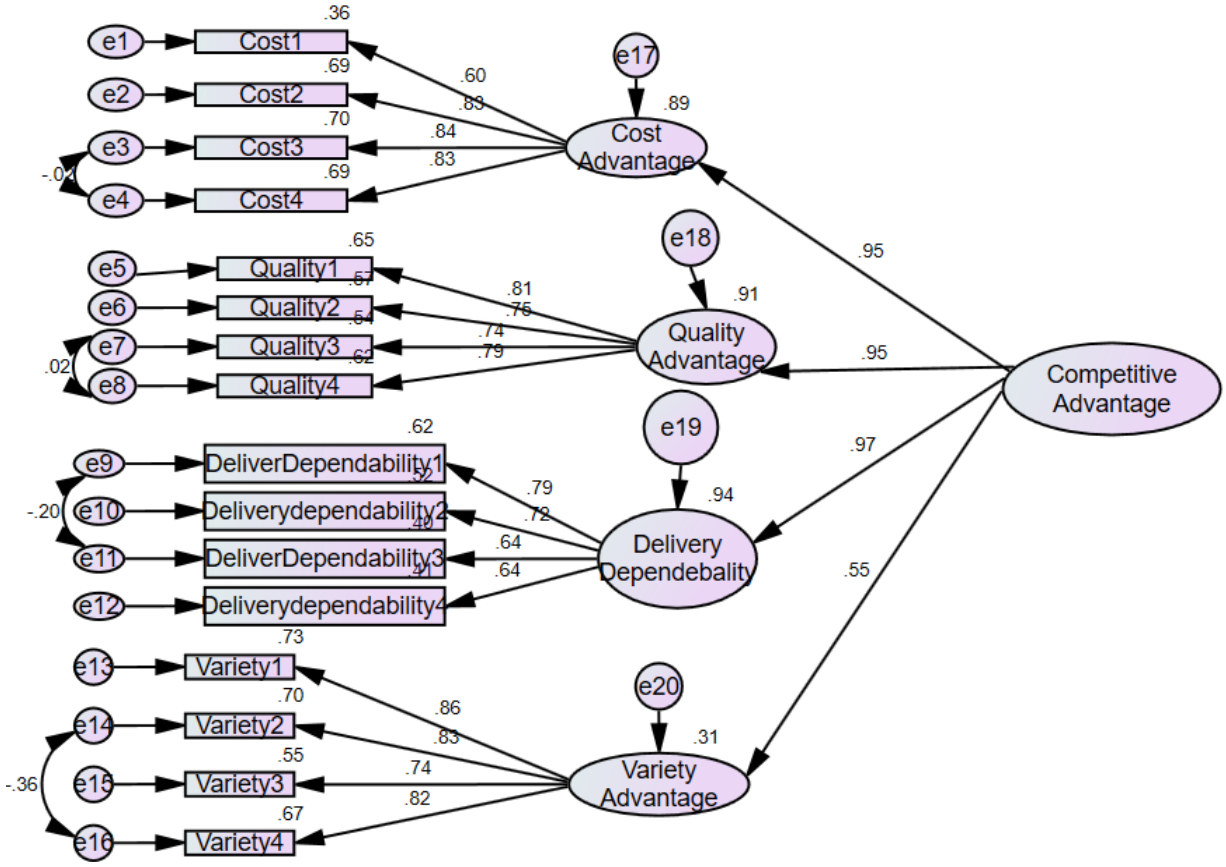


Figure 3: Measurement model for competitive advantage

Table 5: Summary of model fit indices for product and process innovations (dependent variables), firm competitiveness (dependent variable) and competitive advantage

Model Fitness Index	Threshold	Outcome for		
		Product & process innovation	Firm competitiveness	Competitive advantage
Chi2 /DF	≤ *5*	1.150	2.016	1.161
GFI	≥ 0.90	0.926	0.992	0.959
AGFI	≥ 0.90	0.912	0.962	0.932
TLI	≥ 0.90	0.930	0.998	0.994
CFI	≥ 0.90	0.950	0.998	0.996
RMSEA	≤ 0.08	0.040	0.041	0.024
P value	≥ 0.05	0.104*	0.133*	0.153*
P close	≥ 0.05	0.890*	0.310*	0.990*

**insignificant value is a perfect fit; Chi2 /DF = Chi-square over degrees of freedom; GFI = goodness of fit index; AGFI = Adjusted goodness of fit index; TLI = Tucker–Lewis index; CFI = Comparative fit index; RMSEA = Root mean square error of approximation; P Value and P close are significance indicators.*

3.5. Full structural equation modeling

In line with structural equation requirements (Sarstedt et al., 2022), all variables in this study were combined. After co-variating error terms using modification indices (Hair et al., 2020), it the model's GOF test result was found to fit well. From the path analysis result of the SEM (Figure 4), all the path coefficients were positive and significant. The Chi2/DF of 1.86, GFI of 0.941, AGFI of 0.934, TLI of 0.981, CFI of 0.996, and RMSEA of 0.034 and P value and P close of 0.107 & 0.872, respectively, all met the required threshold.

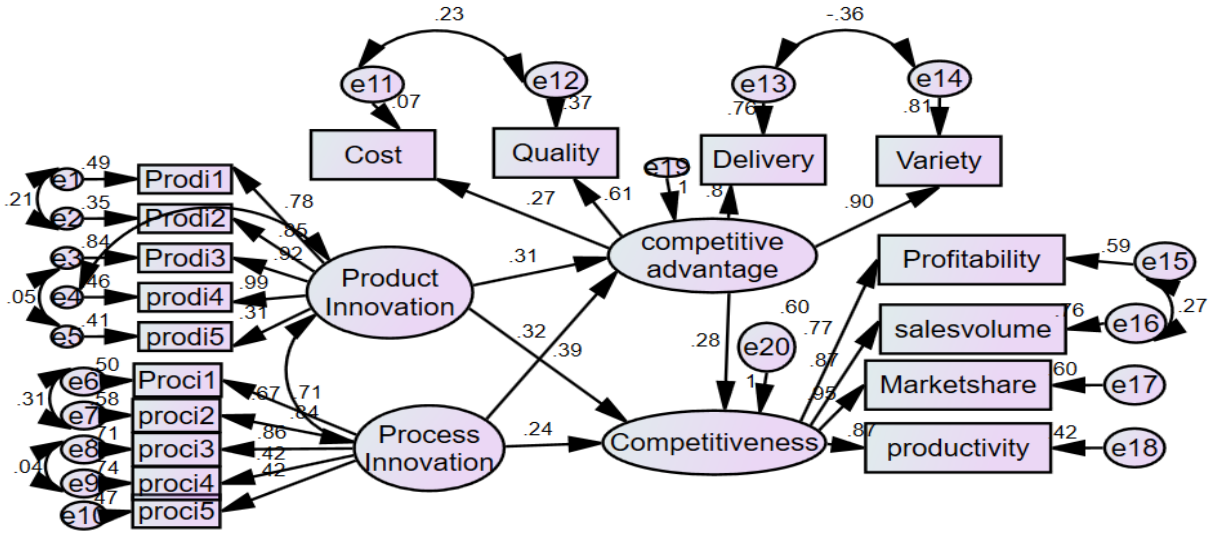


Figure 4: Full structural model of the mediation model

To test the mediation role of competitive advantage between product and process innovations and competitiveness, AMOS v23 was used and the result is presented in Table 6.

On the path coefficient of the structural model, all the hypothesized relationships were produced at once. Relevance-wise, path coefficients often fall between -1 and +1; coefficients near -1 signify strong negative links, while those around +1 indicate strong positive relationships (Kang et al., 2021). This study's path coefficients were relevant in that none of them were out of the range (Table 6). Significance evaluation was established based on bootstrapping of standard errors that calculates t-values of the path coefficients. Consequently, all path coefficients were positive and significantly different from zero (P<0.001; C.R.>1.960).

The first relationship in mediation model to check for was whether the independent variable directly affects the dependent variable (first hypothesis, Ha1). It connects the relationship between product innovation and competitiveness, with positive and significant (β =0.39; p<0.001; C.R. = 6.84) standardized path coefficient. Therefore, when product innovation increases by one standard deviation, competitiveness increases by 0.39 standard deviations. The critical ratio (C.R.) of 6.84 means that the competitiveness of large and medium-sized manufacturing enterprises in Ethiopia is basically affected by product innovation.

The second hypothesis (Ha2) tested in this model is about the relationship between the first independent variable and the mediating variable. Accordingly, the standardized path coefficient between product innovation capability and competitive advantage is positive and significant (β =0.315; p<0.001; C.R = 4.4). This indicates that one standard deviation increase in product innovation capability would cause a 0.315 standard deviation change in competitive advantage.

Table 6: Standardized regression weights: group number 1 - Default model (p is significant at 0.000)

Dependent variables	Paths (Effects)	Independent variables	Estimate	S.E.	C.R.
Competitive Advantage	<----	Product Innovation	0.315	0.072	4.40
Competitive Advantage	<----	Process Innovation	0.326	0.066	4.94
Competitiveness	<----	Process Innovation	0.240	0.061	4.00
Competitiveness	<----	Competitive Advantage	0.280	0.063	4.45
Competitiveness	<----	Product Innovation	0.390	0.057	6.84

S.E. is Standard error and C.R. is critical ratio.

The mediation model in the third path connects the relationship between the mediating variable and the dependent variable (Ha3). The significance of this relationship is also a prerequisite for going for further analysis of whether a given variable mediates the relationship between the dependent and independent variables. The result in the current study indicates that, the standardized path coefficient between competitive advantage and competitiveness is positive and significant (β =0.28; p<0.001; C.R = 4.45). That is a one standard deviation change in competitive advantage will cause a 0.28 standard deviation increase in the competitiveness of manufacturing firms in Ethiopia, giving a support to Ha3.

Then is the second independent variable, which is the relationship between process innovation and competitiveness through the mediating variable (Ha4). Accordingly, the standardized path coefficient between process innovation and competitiveness is again positive and significant (β =0.24; p<0.001; C.R = 4.00). Therefore, when process innovation increases by one standard deviation, competitiveness increases by 0.24 standard deviations supporting Ha4.

The fifth hypothesis (Ha5) was about the relationship between the second independent variable to the mediating variable. The standardized path coefficient between process innovation and competitive advantage was also positive and significant (β =0.315; p<0.001; C.R = 4.4). This indicates that a one standard deviation increases in process innovation capability would cause a 0.326 standard deviation change in competitive advantage, supporting Ha5. Thus, all the preconditions for the mediation analysis were fulfilled.

For Ha6 and Ha7, AMOS based result on the direct, indirect and total effect of product innovation and process innovation on competitiveness is given in Table 7. Accordingly, because product innovation directly affects competitiveness, a one standard deviation increase in product innovation corresponds to a 0.39 standard deviation increase in competitiveness. This is in addition to any potential indirect impact product innovation may have on competitiveness. Furthermore, there was a positive and significant direct unmediated influence of product innovation on competitive advantage (B=0.315, P=0.00, C.R=4.4), as well as a positive and significant direct unmediated effect of competitive advantage on firm competitiveness (B=0.28, p=0.00, C.R=4.45), indicating the precondition for mediation analysis to take place was fulfilled.

Similarly, because process innovation directly affects competitiveness, a one standard deviation increase in process innovation corresponds to a 0.24 standard deviation increase in competitiveness. This is again in addition to any potential indirect impact that process innovation may have on competitiveness.

Furthermore, there was a positive and significant direct unmediated influence of process innovation on competitive advantage (B=0.326, P=0.00, C.R=4.94), as well as a positive and significant direct unmediated effect of competitive advantage on firm competitiveness (B=0.28, p=0.00, C.R=4.45).

Table 7: Standardized direct, indirect and total effects

Effect type	**Process Innovation**	**Product Innovation**	**Competitive advantage**
Standardized direct effects			
Competitive Advantage	0.326	0.315	-
Competitiveness	0.240	0.390	0.280
Standardized indirect effects			
Competitive Advantage	-	-	-
Competitiveness	0.068	0.110	0.000
Standardized total effects			
Competitive Advantage	0.326	0.311	-
Competitiveness	0.308	0.500	0.280

Additionally, the 0.50 total effect of product innovation on competitiveness is the summation of the direct and indirect effect of product innovation on competitiveness (0.39 and 0.11). The same is true for the total effect of process innovation on competitiveness. AMOS bootstrapping technique revealed that both product and process innovations were having a significant indirect effect with p values <0.05 and upper and lower bootstrap confidence interval all crossing zero (the result for the indirect effect of product innovation was p = 0.004, lower and upper bootstrap confidence intervals = 0.02 and 1.391 and p=0.040, lower and upper bootstrap being 0.41 and 0.724 for indirect effect of process innovations on competitiveness). Of the two types of mediation role, partial mediation as all path coefficients were statistically significant predictors and also the variance accounted for was in the partial mediation range (Hair et al., 2014). Finally, explanatory power of the model had R^2 value of 0.60, indicating that 60% variations of manufacturing firms competitiveness was caused by the combined effect of product and process innovations as well as competitive advantage.

3.6. Implication of the results

In this study, while product and process innovations were taken as latent independent variables, competitive advantage was taken as a latent mediating variable and competitiveness was perceived as a latent endogenous variable. Considering the forst hypothesis (Ha1), the result from data analysis was against the null hypothesis as the direct effect of product innovation on competiveness is significant and positive. This finding is closely related to empirical investigations claiming that product innovation directly affects firms' competitiveness (Kidest 2023; Wondifraw et al., 2022; Samuel, 2023; Yulianto & Supriono, 2023). Therefore, the more product innovation practices in the manufacturing industries of Ethiopia, the more competitive they are.

Based on hypothesis two (Ha2), the more firms are strong enough in practicing product innovations, the more they can gain competitive advantage over their rivals (YuSheng & Ibrahim, 2020; Megersa et al., 2018). The implication of the third hypothesis (Ha3) goes that when firms innovate more in their processes and techniques, they would gain competitiveness. YuSheng & Ibrahim (2020) also found process innovation to significantly and positively affect a firm's performance.

The data analysis result referring to hypothesis four (Ha4) has the implication that when firms are engaged more in the process innovations, the more they are in their competitive advantages compared to others. This finding conforms to (Alinda et al. (2024) study, where process innovation was found to be an antecedent to greater performance and competitive advantage. On the other hand, the implication of the fifth hypothesis (Ha5) was that when firms gain competitive advantage over their rivals in terms of lower cost advantage, quality products offered to market, variety of products as per the need of customers and speedy delivery of goods required to customers, they would gain competitiveness in terms of profitability, productivity, market share growth and sales growth compared all others in the market leading to continuous survival. This findings is clearly conforms to the findings of Wijayanto et al. (2017) and Aidara et al. (2021).

The implications for the mediation model targeting hypothesis six (Ha6) was that the more product innovations are practiced in the manufacturing sector of Ethiopia, the more the firms can gain competitive advantage and finally the more competitive they are compared to those with no product innovations. Similar concepts were disclosed by Novitasari & Agustia (2022). Similarly, the implication of the results targeting hypothesis seven (Ha7) was that the more process innovations are in the manufacturing firms of Ethiopia, the more competitive advantage they would gain which finally leads to competitiveness. Literatures in management support the mediation role of competitive advantage between different organizational capability elements including innovation and firms' competitiveness (Yuliantari & Pramuki; 2022; Firdaus & Sakinah; 2023).

4. Conclusions and Recommendation

The result of the data analysis and the corresponding discussion of this study indicated that both product and process innovations have a direct, significant and positive effect on competitiveness of manufacturing firms in Ethiopia. It was also found that competitive advantage positively and significantly affect the competitiveness of manufacturing firms. In addition,

competitive advantage significantly and positively mediated the relationship between product innovation and competitiveness and also the relationship between process innovations and competitiveness. Similarly, the mediation role of competitive advantage between process innovations and competitiveness was significant and positive. In conclusion the more firms in the manufacturing sector of Ethiopia practice process and product innovations, the more they would gain competitive advantage and competitiveness. Moreover, competitive advantage could partially significantly mediate the relationship between product innovation and competitiveness as well as process innovations and competitiveness. Thus, owners and managers of manufacturing firms in Ethiopia are recommended to continue to formulate their strategies which support introduction of product and process innovations if they are to be competitive enough in the national and international markets. Moreover, policy makers are suggested to encourage innovative ideas and processes that can help manufacturing firms' competitiveness in Ethiopia grow.

This study showed that innovation is not only a strategic tool but also an avenue for increased profitability for firms. Thus, business managers are advised to strive for continuous evaluation of their strategies geared towards innovation if they are to survive in the ever-increasing competitive market. They need to integrate the firms' acquired knowledge with that of customer insight in their innovation processes. Despite its strengths, this study has certain limitations that offer opportunities for future research. Firstly, because the study design was cross-sectional and the data was collected from a developing country, it created the assumption that there was a static relationship between the variables. This could be addressed by a replicated study using a longitudinal research design or a multi-country context study, which could uncover more nuanced dynamics of the product and process innovations and firm's competitiveness analogy based on differences in socio-economic and cultural values. Secondly, additional research could be conducted to investigate whether there are any variations in the hypothesized relationships across different business sectors.

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