Pakistan Journal of Humanities & Social Sciences Research
Volume No. 05, Issue No. 02 (December, 2022)

ISSN (P): 2663-9211 (E): 2663-922X
DOI:

Date of Submission: 24th September, 2022
Date of Acceptance: 22nd October, 2022
Date of Publication: December, 2022

EXPLORING THE COMPLEMENTARY EFFECT INNPVATION STRATEGIES ON FIRM'S EXPORT PERFORMANCE

Bushra Zulfiqar* Abdul Rashid & Muhammad Akram*****

Abstract

Innovation is an important requisite for firm growth. It provides competitive advantage to firms in both domestic market and in international market. Past studies have examined the effect of different types of innovation and their pair-wise combination on exports. However, the role of all types on innovation may have more complementary effects on exports of firms. The purpose of this study is to analyze the role of quadruple-complementarity among different innovative strategies in promoting exports of firms using the data of World Bank Innovation surveys and different World Bank Enterprise surveys of year 2013 for Pakistan, Bangladesh, and of year 2014 for India. Estimation is carried out using logistic regression. The finding indicates that existence of quadruple complementarity among different innovation strategies in innovation-export relationship, suggesting that, export's sales of firm will be greater by simultaneously adopting all innovation strategies compared to adoption of either strategy. This study help in accessing integrated effect of different types of innovation strategies on exports of firm.

Keywords: *Labor Productivity, Innovation, Research and Development, Jel classification: E24, O31, O32.*

* Phd Scholar. International Institute of Islamic Economics (IIIE), International Islamic University Email: bushrazulfiqar99@hotmail.com

** Professor/ Director General, International Institute of Islamic Economics (IIIE), International Islamic University, Islamabad, Pakistan

*** Assistant Professor International Institute of Islamic Economics (IIIE), International Islamic University, Islamabad, Pakistan.

Introduction

Globalization has increased competition in business environment and demands greater efficiency. With the increase in competition, survival of firm is becoming more and more challenging. Therefore, firm must maintain competitive advantage in the market to ensure its survival (Britt, 2007; Dereli, 2015; Madonsela, Mukwakungu, & Mbohwa, 2017). In the modern business world regarding organizations, innovation is perceived as a key source of competitive power in progressively changing world and help to stimulate exports of firm (Dess & Picken, 2000; Hallak & Sivadasan, 2008). According to the McKinsey report reveals that 84% of managers agreed that future success of firm is based on innovation, which enables firms to survive in the competitive markets, and ultimately contributes to economic growth (Kylliäinen, 2019). Past studies found that innovation positively influence exporting performance of firm (Bertarelli & Lodi, 2018). Some other studies find negative effects of innovation on export performance of firms .The negative effect is attributed to same location of innovative firms, which promotes intense competition, and certification constraints (Musleh ud, Ghani, & Mahmood, 2009; Roper & Love, 2002).

While innovation is generally found to have beneficial effects on exporting behavior of the firm, the effect of different types of innovation, i.e. product, process, organizational and marketing innovation, vary in different situations. Tavassoli (2018) found positive relationship between product innovation and exporting behavior. Moreover, Ayllón and Radicic (2019) found a positive relationship between product and process innovation and exports of firms. Organizational innovation affects export performance of firms directly and indirectly by enhancing the role of product and process innovation (Azar & Ciabuschi, 2017). Heredia et al. (2019) found that combination of process innovation and marketing help firm to promote exports. Previous studies also examined the effect of different types of innovation, as well as their pair-wise combination, on exports. Bertarelli and Lodi (2018) examined the pair-wise complementarity between product innovation and process innovation product innovation and non-technological innovation, and, process innovation and non-technological innovation. Results shows that combining different innovation strategies benefit large firm in promoting exports, while, small firm used alternative innovation strategies due to limited resources to carry out research and development activities.

Review of Literature:

2.1. Determinants of Innovation

Economists are of the view that innovation is essential for firm survival, economic growth and development. The validity of this proposition is particularly evident in developing countries, where much of the population is engaged in activities far from the technological frontier (Schumpeter, 1942). The relationship between innovation, and different factors affecting innovation, is rooted in Schumpeterian theory of creative destruction. According to this theory, introduction of modified goods, methods of production, organizational procedures and marketing strategies replace existing product and production methods which in turn affect economic growth. Thus innovation is important component of market economy (Schumpeter, 1934, 1943).

Schumpeter (1942) argued that with increase in size of firm, probability to innovate increase. Schumpeter was of the view that large firms have more resources to innovate which enable them to reap maximum profit and thereby more resources for innovation. Studies view size of firm as an important determinant of innovation. Increase in size leads more innovative development of firm and help firm to innovate in product and technology(Abdu & Jabir, 2018). In contrast, Chen (2017) argued that small firms are more likely to innovate than large form due to rapid internal communication, supportive leadership, and less rigid organizational structure. Cisková and Ďurčeková (2019) found that small firms are more innovative in product, while, large firms direct efforts towards process innovation. This study analyzed effect of size on product and process innovation. Accordingly research hypothesis is as follows.

HS: Size of firms significantly affects innovation.

The literature also reveals that age effects firm probability to innovate. Kireyeva , Nurbatsin, Yessentay, Bagayeva, and Turdalina (2021) found that argued that age is significant factor in determining innovation capacity of firm. In contrast, Abdu and Jabir (2018) found that younger firms are more innovative. They analyzed effect of age on product and process innovation. Accordingly research hypothesis is formulated as

HA: Age of firm significantly affects innovation.

However, studies also reported non-linear relationship between age and innovation. Tran and Santarelli (2013) found U-shaped relationship of innovation with age of firm. Firm's probability to

innovate increase up to certain level of age after that decreasing trend starts. De Jong and Vermeulen (2006) found that age has negative effect on product innovation.

Nature of ownership of firm determines the firm capacity to innovate. Jang (2017) studied the determinants of innovation in South-Korea for high technology and low technology industries. Results revealed that foreign ownership was contributing to innovation in low technology industry. Goel and Nelson (2018) found that firms with sole proprietors are more innovative than their counter part. Kireyeva et al. (2021) also found that foreign owned firms are more likely to innovate in product and process innovation. This study analyzed effect of firm's ownership on product and process innovation. Accordingly, the research hypothesis is as follows

HL: legal status of firm significantly affects innovation.

Competent workforce is an important determinant of innovation. According to Djampagau, Salim, Rofiaty, and Wijayanti (2018) active creation and process of knowledge adds to human capital, which promotes innovation. Human capital increases probability to carry out product innovation and helps firm to improve competitiveness. In contrast, Abdu and Jabir (2018) found negative effect of education on innovation. Further, Khan (2021) stated that knowledge of employee along with innovative environment of organization motivates employee to innovate. This study analyzed effect of education of employees on product and process innovation. Accordingly, research hypothesis is formulated as

Hed: Education of firm employees significantly affects innovation.

Literature shows that skilled work force is important determinant of innovation of firm (Fonseca, Faria, & Lima, 2019; Ma, Zhai, Zhong, & Zhang, 2019). According to Dostie (2018) , an increase in stock of human capital, by formal training, increases innovative activity of firm. Study found that by increasing intensity of on job training, propensity of firm to innovate in product and process increase. Abdu and Jabir (2018) also emphasized the importance of training in improving innovation capacity of firm. Kireyeva et al. (2021) also found similar evidence. This study analyzed effect of education of employees on product and process innovation. Accordingly, research hypothesis is as follows

Htr: Training of firm employees significantly affects innovation.

Some studies argued that availability of finance ensure effective innovation and aids in creative innovation. Abdu and Jabir (2018) found that financial support for research and development and support from other research and development institution positively

affects innovation. Ali, Reed, and Saghaian (2021) found that investment in research and development activities positively affects firm's ability to carry out product innovation. This study analyzed effect of research and development activities on product and process innovation. Accordingly research hypothesis is formulated as
H r&d: Spending on research and development activities significantly affects innovation.

2.2. Innovation and Exports

The theoretical basis of innovation-exports relationship lies in two broad foundations. One is Neo-endowment model which emphasized the role factor endowments of labor, human capital and material in influencing specialization (Wakelin, 1998). Second foundation relates to technology centered models such as technology-gap theory of trade (Posner, 1961) and product cycle theory (Krugman, 1979; Vernon, 1966). Studies found that firms undertaking innovation are net exporters and have low price elasticity and high income elasticity (Greenhalgh, 1990). Furthermore, innovation also leads to improve volume of trade and balance of trade (Greenhalgh, Taylor, & Wilson, 1994). Studies find that innovation positively influences exporting performance of firm (Bertarelli & Lodi, 2018). Tavassoli (2018) found a positive relationship between product innovation and exporting behavior. Cieslik and Michałek (2018) also found the positive effect of product and process innovation on firm export performance in Visegrad countries. Gajewski and Tchorek (2017) found that product innovation significantly contribute towards export performance of firm, while, process innovation has no effect. In contrast, Bigos and Michalik (2020) found that process innovation plays positive role in boosting export performance of firm while, product innovation has negative effect. Haddoud, Onjewu, and Nowiński (2021) also found positive effect of process innovation on export intensity. Edeh, Obodoechi, Ramos-Hidalgo, and Change (2020) studied the effect of product, process and marketing innovation on export performance in Nigeria. Study found that product innovation has negative effect, while process and marketing innovation has positive effect on export performance of firm. The negative effect of product innovation is argued to lack of skilled employees which are vital to make innovation in product.
Studies also examined the joint effect of different types of innovation on exports. Edeh et al. (2020) found that combine effect of product, process and marketing innovation has significant effect on export

performance. Acquaah and Yasai-Ardekani (2008) in Sub-Saharan Africa found that both between product and process innovation may affect exports more efficiently. Bodlaj, Kadic-Maglajlic, and Vida (2020) found that product, process and organizational innovation have positive effect on export growth of SMEs. Bertarelli and Lodi (2018) examined the pair-wise complementarity between product innovation and process innovation, between product innovation and non-technological innovation, and, process innovation and non-technological innovation. Results shows that combining different innovation strategies benefit large firm in promoting exports, while, small firm used alternative innovation strategies due to limited resources to carry out research and development activities. Heredia et al. (2019) found that combinations of process innovation and marketing help firm to promote exports. Studies also examined the effect of different types of innovation, as well as their pair-wise combination, on exports however, there is need to examine the effect of technological innovation when it is complimented by non-technological innovation on exports of firm. Accordingly research hypothesis is as follows

Hexp: All innovation strategies, when adopted simultaneously, result in better export performance of firm.

Methodology

The theoretical framework of effect of innovation on exports, is built on the model presented by Caldera (2010) who extends the work of (Bustos, 2005, 2011). In this scenario a firm would take decision to innovate in order to reduce their marginal cost of production and improve technology. However, firm can reduce their marginal cost if they are productive enough. Further, innovative firms are more likely to be exporters. Assuming CES preference utility the consumer demand function for number of varieties i is derived using utility function and budge constraint as follows

$$U = \left[\int_0^n yi^p di\right]^{\frac{1}{p}} \quad (1)$$

And

$$\int_0^n p(i)y(i)di = EXP \quad (2)$$

Accordingly demand for variety i is as follows

$$y(i) = \frac{EXP}{P}\frac{p(i)}{P}^{-\alpha} \quad (3)$$

where α= 1/1-p>1 represent constant elasticity of substitution. On the

supply side firm have to choose to innovate or not depending upon productivity parameter since firm has to face fixed cost of innovation (Bustos, 2005, 2011; Melitz, 2003). Firm facing pareto cumulative distribution function G (φ)= 1-φk will make price and innovation choice which maximize their profit as

$$p^I(\varphi) = \frac{1}{\rho}\frac{c}{\varphi} \quad (4)$$

where c is marginal cost. According to (Bustos, 2005, 2011), outpot sold y, revenue r and profit λ are given by

$$y^I(\varphi) = \text{Exp}P^{\sigma-1}\left[\rho\frac{\varphi}{c}\right]^{\sigma} \quad (5)$$

$$r^I(\varphi) = P^i(\varphi)Y^i(\varphi) = \text{Exp}\left[P\rho\frac{\varphi}{c}\right]^{\sigma-1} \quad (6)$$

$$\lambda^I(\varphi) = \frac{1}{\sigma}r^I(\varphi) - FC \quad (7)$$

Firms would innovate if innovating profit is greater than non-innovating profit i.e

$$\lambda^{I=1}(\varphi) - \lambda^{I=0} = (\varphi) > 0 \quad = \quad \frac{1}{\sigma}(ExpP(\varphi)^{\sigma-1}(c_{I=1}^{1+\sigma} - c_{I=0}^{1+\sigma} > FC_{I=1} - FC_{I=0} \quad (8)$$

In case of exports firm incurs need fix cost FC and variable cost V. Firm exporting profit is given by

$$\lambda^{*I}(\varphi) = V^{1-\sigma}ExpExp^*P^*\rho^{*\sigma^*-1}\frac{1}{\sigma^*}c_I^{1-\sigma^*}\varphi_I^{\sigma^*-1} - FC_x \quad (9)$$

Exp* and P* foreign spending and price index respectively. Firm would choose to export if profit from exporting in both foreign market and domestic market is greater than only in profit in domestic profit.i.e

$$\lambda^{*I}(\varphi) + \lambda^I(\varphi) > \lambda^I(\varphi) \quad (10)$$

While non-innovator would choose to export if profit obtained from exporting exceeds fix cost. The reduced form of equation 10 is as follows

$$EXP = 1/_{EXP = 0\ otherwise}\ if\ \lambda^{*I} = \beta I_{it} + \alpha TFP_{it} + \gamma Z_{it} + \mathsf{C}_i + \delta_i + \in_i + \int_{it} \quad (11)$$

where C_i and δ_i are time specific and sector specific component respectively. We used this model with some modifications. Further, studies highlighted the role of different types of innovation on export (Fonchamnyo, Wujung, & Finance, 2016; Pino, Felzensztein, Zwerg-Villegas, & Arias-Bolzmann, 2016), however the detailed analysis of complementarity between different types of innovation is missing which helps to understand the export performance of firm when different innovation strategies are used simultaneously .We checked

the implication of phenomenon in two setting. At first step the effect of different types of innovation on export performance of firm is estimated. At second step the complementarity between different types of innovation is analyzed.

In order to check the impact of innovation on export by quadruple complementarity using four innovation strategies simultaneously as compliment, following Caldera (2010) the proposed model is as follows

$$EI_i = \pi_0 + \alpha_o SIZE_i + \alpha_1 AGE_i + \alpha_2 CORRUPTION_i + \alpha_3 PROD_i + \beta_1 PDPROM_i + e_i \quad (12)$$

where, EI is percentage share of exports in total sales of firm. Control variables are SIZE, AGE and CORRUPTION. Where PDPROM is probability of all types of innovation. The effect of complementarity of all types of innovation is determined by the significance of coefficient βi. There is possibility of endogeneity since firm's exports and innovation increase when it anticipates increase demand in foreign countries. Van Reenen (1997) proposed use of lag value of innovation to address endogeneity. This study used cross sectional data for which lag values are not applicable. Therefore, following Waheed (2012) we used predicted values of innovation. The propose equation is as follows

$$Inn_i^m = \pi_0 + \alpha_o SIZE_i + \alpha_1 AGE_i + \alpha_2 R\&D_i + \alpha_3 EDU_i + \alpha_4 TRAINING_i + \alpha_5 LEGAL_i + e_i \quad (13)$$

The equation 13 shows innovation as a dependent variable as dummy variable which take value of 1 when firm undergo all types of innovation and otherwise zero. This study analyzed the impact of innovation on exports of firm by analyzing the role of complementarity among four types of innovation i.e. product innovation, process innovation, organizational innovation and marketing innovation. The effect of four innovation strategies on exports is analyzed using four innovation strategies simultaneously as compliment. Control variable comprised of various factor that affect innovation i.e. size age, R&D EXP , education of employees, training of employees and legal status of firm while Inn is Innovation variable. The equation 13 is regressed by using probit model as it can overcome challenges related to linear probability model. The predicted value of innovation from equation 13 is be incorporated into export equation as follows

$$EI_i = \pi_0 + \alpha_o SIZE_i + \alpha_1 AGE_i + \alpha_2 CORRUPTION_i + \alpha_3 PROD_i + \beta_1 \widehat{PDPROM}_\iota + e_i \quad (14)$$

where PDPROM is predicted probability of all types of innovation from equation 13. The effect of complementarity of all types of

innovation is determined by the significance of coefficient βi. Data has been obtained from World Bank Enterprise Survey. The World Bank Enterprise Survey published data of enterprise survey for manufacturing and services firms using two set of questionnaires. Along with this World Bank also provides the data of innovation survey for these firms in which firms were asked to provide information about different types of innovation carried out in their production The study used data of World Bank Innovation surveys and World Bank Enterprise surveys of Year 2013 for Pakistan and Bangladesh and World Bank Innovation and Enterprise survey of Year 2014 for India from World Bank (2023) . This study uses information from both these surveys to obtain desired objectives.

Results and Discussions

The study has conducted to analyze the role of quadruple-complementarity among different innovative strategies in promoting exports of firm. Evaluation was based on various criteria using appropriate econometric and statistical techniques.

Table 1

Quadruple Complementarity in Export and innovation

Determinant of Innovation				Quadruple Complementarity using four innovation strategies simultaneously as compliment			
Dependent: PDPROM		Coef.		Dependent: Export share		Coef.	
	Bangladesh	India	Pakistan		Bangladesh	India	Pakistan
Age	0.0026 (0.1078)	-0.0036* (0.0019)	0.0123* (0.0071)	age	-0.22161*** (0.0725)	0.03571 (0.0251)	-0.2023 (0.2005)
RCedu	0.0058** (0.0020)	-0.0035*** (0.0010)	-0.0011 (0.0037)	Sizedum1			

RCtraining	0.0988 (0.1108)	-0.0317 (0.0583)		sizedum2		-4.9766*** (1.5635)	
RCh7	0.2147* (0.1259)	0.4369*** (0.0564)	0.8110*** (0.2466)	sizedum3	3.7739 (4.4162)	-1.6721 (2.1866)	
Sizedum1				Sizedum4	47.3688*** (6.1596)		
sizedum2	-1.6308* (0.1911)	1.5219*** (0.1216)		Corrdum3		-2.6574** (1.2432)	
sizedum3	-0.3516** (0.1127)	1.8921*** (0.1280)	0.7334*** (0.2554)	Corrdum4		-2.2919** (1.1138)	
Legaldum1				Corrdum5		0.1139 (1.0201)	
legaldum2	0.7071** (0.3507)	-0.0494 (0.1828)	0.6614 (0.6033)	Corrdum6	-4.8195** (2.2920)		
legaldum3	0.9336** (0.3479)	0.1091 (0.1718)	0.4978 (0.4983)	Corrdum7	-4.8231* (2.7676)	2.0647* (1.1173)	
legaldum4	0.9781** (0.3479)	0.0969 (0.1754)	-0.4914* (0.2646)	productivity	-3.4210* (2.0711)	-1.2678 (0.8111)	-4.6654 (3.2458)

legaldum5		0.3006* (0.1699)		P1	-18.9381 (14.7880)	38.5264*** (4.8395)	98.9397*** (37.2943)
legaldum6		0.2713 (0.2238)		Cons	13.2829*** (3.9280)	2.2384 (1.6092)	11.4716** (5.1940)
Age square	-0.0002 (0.0002)						
Cons	-1.4191*** (0.3798)	-2.3330*** (0.2141)	-2.3909*** (0.3757)				

*: significant at 10 percent, **: significant at 5 percent, ***: significant at 1 percent

Table 1 shows the impact of innovation on exports of firm by analyzing the role of complementarity among four types of innovation strategies simultaneously as compliment. First equation shows factors determining probability of firm to undertake all types of innovation.

The results show that age has significant positive effect of all types of innovation when carried out simultaneously in Pakistan, while, negative and insignificant effect in India and Bangladesh respectively. Positive effect may be attributed to probability of younger firm are less likely to innovate than older ones (Abdu & Jabir, 2018). According to Kireyeva et al. (2021), age is significant factor in determining innovation capacity of firm. However, Abdu and Jabir (2018) argued that younger companies are more inventive than older ones

Moreover, new companies may confront barriers to innovation in term of prior expertise, shortage of financial assets (Schoonhoven, Eisenhardt, & Lyman, 1990; Tripsas, 1997). However, some studies also argued that Younger companies are more inventive than older ones (Tran & Santarelli, 2013; Waychal, Mohanty, Verma, & Research, 2011), since, they are more likely to participate in innovation activities because of less risk of cannibalizing existing

product portfolios or disrupting main competencies (R. Henderson, 1993; Tushman & Anderson, 1986). In Bangladesh age has insignificant effect on innovation. Although, companies improve their innovation strategies the passage of time, however they may not be able to produce innovative strategies which may competitive at commercial level (Meijdam, 2017). Bangladesh rank at 116th in 132 countries in global innovation index (Dutta, Lanvin, León, & Wunsch-Vincent, 2021) which shows that innovative efforts in Bangladesh need to be updated. These finding confirm hypothesis HA for Pakistan but negate for India and Bangladesh. With increase in competition in global market education plays important role in research and development capabilities of firms, since, highly educated workforce through their skill contributes to innovation, and thereby, improves competitiveness of firm (Khan, 2021). In this study, education of employees has insignificant effect on innovation in Pakistan The literacy rate in Pakistan is lowest among south Asian countries. In addition to this Pakistan ranks 134 out of 157 countries in investment in human capital. Both these factors contribute to low performance of employees and week innovative potential in their jobs (Shabbar, 2021). Insignificant effect of education of employees on innovation was reported by Leong and Rasli (2014). Education of employees has negative effect on innovation in India. According to Stuart and Abetti (1990), with increase in number of employees who completed secondary or higher education, chances of innovation decrease. Authors argued that involvement in business environment is more helpful in improving business performance. Education of employees has positive effect on innovation in Bangladesh. Blundell, Griffith, and van Reenen (1999) argued that educated employees are more efficient in performing new tasks, and thus, promote innovation. Similarly, Romer (1990) in his endogenous growth theory stock of knowledge accumulated in past as key determinant of innovation. Employees with specialized knowledge hold particular abilities like power of communication and effective decision making, highly problem solving and efficient team management skills, the capability to become accustomed to continuously dynamic situations, hence tending to perform professionally in day-wise routine tasks (Agiomirgianakis, Asteriou, & Monastiriotis, 2002; Psacharopoulos & Patrinos, 2004). These finding confirm hypothesis Hed. Results show that training of employees has insignificant effect on innovation. Studies found that there exist lag effect in realizing the outcome of training, which is part of human resource management activities, in term of innovation, since, human resource management

practices require considerable time lag before being realized into outcome (Collins & Clark, 2003; Guest, 2001; Wall & Wood, 2005; Wright, McCormick, Sherman, & McMahan, 1999). Moreover, there may be not be sufficient training and development program initiated by companies which create innovativeness among employess (Michaelis & Markham, 2017). These finding does not support hypothesis Htr .

Results show that spending on Research and development is positively associated with innovation. Spending on Research and development expenditure improves the capacity of firm to innovate (Schmidt & Rammer, 2006). Finding also support Romer (1990) endogenous growth which stated that number of worker devoted for research and development activities are key determinant of innovation. Moreover, willingness and active involvement to innovate and research and development activity significantly affect innovation (Joshi, 2017). These finding confirm hypothesis Hr&d .Firm size has positive effect on innovation , as, Increase in size may lead to reduction of cost, and thus, encourage firm to make innovation (Cohen & Klepper, 1996). Findings support Schumpeter (1942) hypothesis according to which increase in size of firm probability to innovate increase. Further, in large sized firms, strong organizational structure, investments in Research and development activities and highly experienced workers are significant factors that determine a firm's ability to carry out innovation (Frambach & Schillewaert, 2002). These finding confirm hypothesis HS .In case of legal status, firms having Partnership have significant effect on innovation. From these finding it may be concluded that Spending on Research and development and size are significant determinants of innovation when carried out simultaneously. Training of employees has insignificant effect on innovation due to lack of sufficient training and development program initiated by companies which create innovativeness among employees (Michaelis & Markham, 2017). Effect of age and education of employees has different effect on innovation in countries included in analysis due to different socioeconomic environment. The difference in determinants of innovation across countries depends on differences in innovative infrastructure and national culture of innovation (Natário, Couto, Tiago, Braga, & Research, 2011).

In second equation, the impact of innovation on firm exports is analyzed by quadruple complementarity i.e by using predicted probability of four innovation strategies simultaneously as compliment. It can be seen that age has insignificant effect on firm's

export in Pakistan and India and negative in Bangladesh. According to Love, Roper, and Zhou (2016), elder firms may be less accessible to external information on exporting than younger firms However, firm may show rigid behavior towards learning new knowledge, which indicate negative relation between age and organizational learning capability, and therefore low export performance (D'Angelo, Majocchi, Zucchella, & Buck, 2013; A. D. Henderson, 1999; Sørensen & Stuart, 2000). Moreover, insignificant effect of age on export performance is also reported by D'Angelo et al. (2013). Size has negative effect on firm export in India, while, positive effect in Bangladesh. According to Verwaal and Donkers (2002), small sized firms may have more competitive advantage than large firms due to flexible organizational structure and thus promote export by quickly adopting specification demanded in foreign market. On the other hand large firms may gain international competitiveness by economies of scale (Gabbitas & Gretton, 2003). Therefore, large firms may increase product competitiveness in international market by achieving economies of scale, while, small firm may adopt competitive strategies like improving product quality to increase exports (Kalafsky, 2004). Corruption has negative effect on exports of firm. Firms that export their products are less likely to bribe a public official in order to get things done. Further, exporting firms are less likely to engage in bribery because they are less susceptible to local corruption and may receive preferential treatment, especially in developing markets where export-oriented policies are strongly supported (Imran, Rehman, & Khan, 2019; Luo & Han, 2009). Productivity of labor negatively affect export share. According Yeaple, Helpman, and Melitz (2004), firms with lower productivity are more likely to engage in exporting, while, high productive firms shift toward foreign direct investment. Predicted probability of four innovation strategies simultaneously, indicated by P1, is significant showing that all types of innovation strategies, when adopted simultaneously, results in better export performance of firm. These finding confirm hypothesis Hexp. Similar findings were reported by Bertarelli and Lodi (2018). Firms adopting different innovation strategies might be in better position to afford the fixed costs involved in an expansion of target markets (Mancinelli, Papalia, & Bertarelli, 2015).

Conclusion

The aim of this study was to examine the role of complementarity among different types of innovation strategies in influencing firm's

export. In the first step study addressed endogeneity between innovation and firm's export by predicting innovation by its determinants. Findings show that spending on research and development is main driver of innovation. However, effect of other firm specific characteristics on innovation, such as age, education and training of employee, vary across countries. In the second step study analyzed the role of complementarity among different types of innovation strategies in influencing firm's export and found existence of quadruple complementarity among different innovation strategies in innovation-export relationship, suggesting that, export's sales of firm will be greater by simultaneously adopting all, four, innovation strategies compared to adoption of either strategy. Therefore, firm may focus on adopting all innovation strategies simultaneously in order to have better export performance. Findings also revealed that age, corruption and productivity has negative effect on firm's export sales .These results indicates that firm may focus on acquiring knowledge for producing competitive export goods and gains in productivity may be used for improving export's sales.

The paper contributes in existing literature in number of ways. Firstly, to our best knowledge this is first study in South Asian region to evaluate the role of quadruple complementarity in innovation in promoting firm's export. Secondly, in this study export intensity is used as measure of exporting performance, while previous research on complementarity between technological and non-technological innovation and exports used export propensity. Using export intensity helps in depicting increase in exports as results of improving products by innovation, which aids in improving balance of trade of country. Thirdly, earlier research on complementarity between technological and non-technological innovation used one combine indicator of non-technological innovation, this study segregated two strategies (organizational and marketing innovation), in order to clarify the effect of using four strategies, simultaneously, on export performance of firms. The finding of this study highlights the importance of innovation in promoting exports of country. The governments of South Asian countries may design policy to make better access of latest research technologies to firm, in order to gain competitiveness in international market. The results may become more productive by integrating export promotion policies with innovation policies.

Bibliography:

Abdu, M., & Jabir, A. (2018). Determinants of firms innovation in Nigeria. Kasetsart Journal of Social Sciences, 39(3), 448-456. doi:https://doi.org/10.1016/j.kjss.2017.07.006.

Acquaah, M., & Yasai-Ardekani, M. (2008). Does the implementation of a combination competitive strategy yield incremental performance benefits? A new perspective from a transition economy in Sub-Saharan Africa. Journal of Business Research, 61(4), 346-354. doi:https://doi.org/10.1016/j.jbusres.2007.06.021

Agiomirgianakis, G., Asteriou, D., & Monastiriotis, V. (2002). Human capital and economic growth revisited: A dynamic panel data study. International Advances in Economic Research, 8(3), 177-187. doi:10.1007/BF02297955

Ali, J., Reed, M. R., & Saghaian , S. H. (2021). Determinants of product innovation in food and agribusiness small and medium enterprises: evidence from enterprise survey data of India. International Food and Agribusiness Management Review, 24 (5), 777 - 796. doi:https://doi.org/10.22434/IFAMR2019.0210

Ayllón, S., & Radicic, D. (2019). Product innovation, process innovation and export propensity: persistence, complementarities and feedback effects in Spanish firms. Applied Economics, 51(33), 3650-3664. doi:10.1080/00036846.2019.1584376

Azar, G., & Ciabuschi, F. (2017). Organizational innovation, technological innovation, and export performance: The effects of innovation radicalness and extensiveness. International Business Review, 26(2), 324-336. doi:https://doi.org/10.1016/j.ibusrev.2016.09.002

Bertarelli, S., & Lodi, C. (2018). Innovation and Exporting: A Study on Eastern European Union Firms. 10(10), 3607.

Bigos, K., & Michalik, A. (2020). The influence of innovation on international new ventures' exporting in Central and Eastern Europe and Central Asia countries. Entrepreneurial Business and Economics Review, 8, 47-63. doi:10.15678/EBER.2020.080303

Blundell, R., Griffith, R., & van Reenen, J. (1999). Market Share, Market Value and Innovation in a Panel of British Manufacturing Firms. The Review of Economic Studies, 66(3), 529-554. doi:10.1111/1467-937X.00097 %J The Review of Economic Studies

Bodlaj, M., Kadic-Maglajlic, S., & Vida, I. (2020). Disentangling the impact of different innovation types, financial constraints and geographic diversification on SMEs' export growth. Journal of Business Research, 108, 466-475. doi:https://doi.org/10.1016/j.jbusres.2018.10.043

Britt, D. (2007). Impact of Globalization in Creating Sustainable Competitive Advantage. Retrieved from https://www.sdcexec.com/safety-security/risk-compliance/article/10289694/flex-impact-of-globalization-in-creating-sustainable-competitive-advantage

Bustos, P. (2005). The Impact of Trade on Technology and Skill Upgrading Evidence from Argentina Retrieved from https://sticerd.lse.ac.uk/seminarpapers/DG15102007.pdf
Bustos, P. (2011). The impact of trade liberalization on skill upgrading. Evidence from Argentina. Retrieved from https://EconPapers.repec.org/RePEc:upf:upfgen:1189
Caldera, A. (2010). Innovation and exporting: evidence from Spanish manufacturing firms. Review of World Economics (Weltwirtschaftliches Archiv), 146(4), 657-689.
Chen, S. (2017). The Relationship between Innovation and Firm Performance: A Literature Review. Advances in Computer Science Research, 82. doi:10.2991/SNCE-17.2017.132
Cieslik, A., & Michałek, J. (2018). Process and product innovations, multi-product status and export performance: firm-level evidence from V–4 countries. Equilibrium, 13, 233-250. doi:10.24136/eq.2018.012
Cisková, P., & Ďurčeková, I. (2019). Determinants of Firms´ Innovation Activities in V4 Countries. Statistics & Economy Journal, 994, 369-382.
Cohen, W. M., & Klepper, S. (1996). A Reprise of Size and R&D. Economic Journal, 106(437), 925-951.
Collins, C. J., & Clark, K. D. J. A. o. M. J. (2003). Strategic human resource practices, top management team social networks, and firm performance: the role of human resource practices in creating organizational competitive advantage. The Academy of Management Journal 46, 740-751.
D'Angelo, A., Majocchi, A., Zucchella, A., & Buck, T. (2013). Geographical pathways for SME internationalization: Insights from an Italian sample. International Marketing Review, 30. doi:10.1108/02651331311314538
De Jong, J. P. J., & Vermeulen, P. A. M. (2006). Determinants of Product Innovation in Small Firms:A Comparison Across Industries. 24(6), 587-609. doi:10.1177/0266242606069268
Dereli, D. D. (2015). Innovation Management in Global Competition and Competitive Advantage. Procedia - Social and Behavioral Sciences, 195, 1365-1370. doi:https://doi.org/10.1016/j.sbspro.2015.06.323
Dess, G. G., & Picken, J. C. (2000). Changing roles: Leadership in the 21st century. Organizational Dynamics, 28, 18-34. doi:10.1016/S0090-2616(00)88447-8
Djampagau, H. R. D., Salim, U., Rofiaty, & Wijayanti, R. (2018). The Relationship of Human Capital, Innovation, and Corporate Performance (A Study of Small and Medium Rattan Businesses in Palu City Central Sulawesi Province). KnE Social Sciences, 3(10), 453-463. doi:10.18502/kss.v3i10.3394
Dostie, B. (2018). The Impact of Training on Innovation. 71(1), 64-87. doi:10.1177/0019793917701116

Dutta, S., Lanvin, B., León, L. R., & Wunsch-Vincent, S. (2021). Global Innovation Index 2021 (14 ed.): © WIPO, 2021.
Edeh, J. N., Obodoechi, D. N., Ramos-Hidalgo, E. J. T. F., & Change, S. (2020). Effects of innovation strategies on export performance: New empirical evidence from developing market firms.
Fonchamnyo, D. C., Wujung, V. A. J. A. E., & Finance. (2016). Innovation and Export Performance: An Empirical Insight on the Effect of Innovation on Manufacturing Firms in Cameroon. 3, 123-133.
Fonseca, T., Faria, P. d., & Lima, F. (2019). Human capital and innovation: the importance of the optimal organizational task structure. Research Policy, 48 (3), 616-627. doi:https://doi.org/10.1016/j.respol.2018.10.010
Frambach, R. T., & Schillewaert, N. (2002). Organizational innovation adoption: a multi-level framework of determinants and opportunities for future research. Journal of Business Research, 55(2), 163-176. doi:https://doi.org/10.1016/S0148-2963(00)00152-1
Gabbitas, O., & Gretton, P. (2003). Firm Size and Export Performance: Some Empirical Evidence. SSRN Electronic Journal. doi:10.2139/ssrn.401401
Gajewski, P., & Tchorek, G. (2017). What drives export performance of firms in Eastern and Western Poland? European Planning Studies, 25(12), 2250-2271. doi:10.1080/09654313.2017.1355890
Goel, R. K., & Nelson, M. A. (2018). Determinants of process innovation introductions: Evidence from 115 developing countries. Managerial and Decision Economics, John Wiley & Sons, Ltd., 39(5), 515-525. doi:10.1002/mde.2922
Greenhalgh, C. (1990). Innovation and Trade Performance in the United Kingdom. Economic Journal, 100(400), 105-118.
Greenhalgh, C., Taylor, P., & Wilson, R. (1994). Innovation and Export Volumes and Prices-A Disaggregated Study. Oxford Economic Papers, 46(1), 102-135.
Guest, D. E. (2001). Human resource management: when research confronts theory. The International Journal of Human Resource Management, 12(7), 1092-1106. doi:10.1080/09585190110067837
Haddoud, M. Y., Onjewu, A.-K. E., & Nowiński, W. (2021). Environmental commitment and innovation as catalysts for export performance in family firms. Technological Forecasting and Social Change, 173, 121085. doi:https://doi.org/10.1016/j.techfore.2021.121085
Hallak, J. C., & Sivadasan, J. (2008). Productivity, Quality and Exporting Behavior Under Minimum Quality Requirements⁄.
Henderson, A. D. (1999). Firm Strategy and Age Dependence: A Contingent View of the Liabilities of Newness, Adolescence, and Obsolescence. 44(2), 281-314. doi:10.2307/2666997

Henderson, R. (1993). Underinvestment and Incompetence as Responses to Radical Innovation: Evidence from the Photolithographic Alignment Equipment Industry. RAND Journal of Economics, 24(2), 248-270.
Heredia, J., Flores, A., Heredia, W., Arango, R., Medina, L. J. J. o. T. M., & Innovation. (2019). How Innovation Influences on Export Performance: A Configuration Approach for Emerging Economies. 14, 54-65.
Imran, S. M., Rehman, H. U., & Khan, R. E. A. (2019). Determinants of corruption and its impact on firm performance: Global evidence Pakistan Journal of Commerce and Social Sciences (PJCSS), 13(4), 1017-1028.
Jang, M. (2017). Determinants of innovation in SMEs: An empirical analysis of South Korea. Radboud University. Nijmegen School of Management.
Joshi, M. (2017). Invention, Innovation and Innovative Practices: A Reason to Study in a VUCA Perspective. Journal of Entrepreneurship, Business and Economics, 5(2), 87-109.
Kalafsky, R. (2004). Export activity and firm size: An examination of the machine tool sector. Journal of Small Business and Enterprise Development, 11, 159-165. doi:10.1108/14626000410537092
Khan, S. (2021). Exploring the firm's influential determinants pertinent to workplace innovation. Problems and Perspectives in Management, 19(1), 272-280. doi:https://doi.org/10.21511/ppm.19(1).2021.23
Kireyeva , A., Nurbatsin, A., Yessentay, A., Bagayeva, N., & Turdalina, S. (2021). Exploring determinants of innovation potential of enterprises in Kazakhstan. Problems and Perspectives in Management, 19(2), 433-443. doi:http://dx.doi.org/10.21511/ppm.19(2).2021.34
Krugman, P. (1979). A Model of Innovation, Technology Transfer, and the World Distribution of Income. Journal of Political Economy, 87(2), 253-266.
Kylliäinen, J. (2019). Disruptive Innovation – What is It and How Does It Work? Retrieved from https://www.viima.com/blog/disruptive-innovation
Leong, C. T., & Rasli, A. (2014). The Relationship between Innovative Work Behavior on Work Role Performance: An Empirical Study. Procedia - Social and Behavioral Sciences, 129, 592-600. doi:https://doi.org/10.1016/j.sbspro.2014.03.717
Love, J. H., Roper, S., & Zhou, Y. (2016). Experience, age and exporting performance in UK SMEs. International Business Review, 25(4), 806-819.
Luo, Y., & Han, B. (2009). Graft and business in emerging economies: An ecological perspective. Journal of World Business, 44(3), 225-237. doi:https://doi.org/10.1016/j.jwb.2008.08.006
Ma, L., Zhai, X., Zhong, W., & Zhang, Z.-X. (2019). Deploying human capital for innovation: A study of multi-country manufacturing firms.

International Journal of Production Economics, 208, 241-253. doi:https://doi.org/10.1016/j.ijpe.2018.12.001

Madonsela, N. S., Mukwakungu, S. C., & Mbohwa, C. (2017). Continuous Innovation as Fundamental Enabler for Sustainable Business Practices. Procedia Manufacturing, 8, 278-283. doi:https://doi.org/10.1016/j.promfg.2017.02.035

Mancinelli, S., Papalia, R. B., & Bertarelli, S. (2015). Complementarity among innovations for exporting in German manufacturing firms. Working Papers 2015044, University of Ferrara, Department of Economics.

Meijdam, L. (2017). DFID Research Project:'Enabling Innovation and Productivity Growth in Low Income Countries (EIP-LIC)'.Country Report Bangladesh. Tilburg University and Radboud University Nijmegen. Retrieved from https://www.tilburguniversity.edu/sites/default/files/download/629363a1-8ba8-4c75-9a26-3327956262a4_Country%20Report%20Bangladesh%20EIP-LIC%20DFID%20Tilburg.pdf

Melitz, M. J. (2003). The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity. Econometrica, 71(6), 1695-1725.

Michaelis, T. L., & Markham, S. K. (2017). Innovation Training: Making Innovation a Core Competency. Research Technology Management; Arlington, 60(2), 36-42. doi:10.1080/08956308.2017.1276387

Musleh ud, D., Ghani, E., & Mahmood, T. (2009). Determinants of Export Performance of Pakistan: Evidence from the Firm-Level Data. The Pakistan Development Review, 48(3), 227-240.

Natário, M. M. S., Couto, J. P., Tiago, M. T. B., Braga, A. M. M. J. G. J. o. M., & Research, B. (2011). Evaluating The Determinants Of National Innovative Capacity Among European Countries. 11, 67-78.

Pino, C., Felzensztein, C., Zwerg-Villegas, A. M., & Arias-Bolzmann, L. (2016). Non-technological innovations: Market performance of exporting firms in South America. Journal of Business Research, 69(10), 4385-4393.

Posner, M. V. (1961). International trade and technical change. Oxford Economic Papers Oxford Economic Papers, 13(3), 323-341.

Psacharopoulos, G., & Patrinos, H. A. (2004). Returns to Investment in Education: A Further Update. Education Economics, 12(2), 111-134. doi:10.1080/0964529042000239140

Romer, P. M. (1990). Endogenous Technological Change. Journal of Political Economy, 98(5), S71-S102.

Roper, S., & Love, J. (2002). Innovation and Export Performance: Evidence from the UK and German Manufacturing Plants (Vol. 31).

Schmidt, T., & Rammer, C. (2006). The determinants and effects of technological and non-technological innovations – Evidence from the German CIS IV.
Schoonhoven, C. B., Eisenhardt, K. M., & Lyman, K. (1990). Speeding Products to Market: Waiting Time to First Product Introduction in New Firms. Administrative Science Quarterly, 35(1), 177-207. doi:10.2307/2393555
Schumpeter, J. A. (1934). The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle. : Harvard University Press.
Schumpeter, J. A. (1942). A. Capitalism, Socialism and Democracy: New York: Harper Brothers.
Schumpeter, J. A. (1943). Capitalism, Socialism, and Democracy: London and New York: George Allen & Unwin.
Shabbar, S. (2021, December, 27). Innovation deficiency in Pakistan. The Express Tribune. Retrieved from https://tribune.com.pk/story/2335751/innovation-deficiency-in-pakistan
Sørensen, J. B., & Stuart, T. E. (2000). Aging, Obsolescence, and Organizational Innovation. Administrative Science Quarterly, 45(1), 81-112. doi:10.2307/2666980
Stuart, R. W., & Abetti, P. A. (1990). Impact of entrepreneurial and management experience on early performance. Journal of Business Venturing, 5(3), 151-162. doi:https://doi.org/10.1016/0883-9026(90)90029-S
Tavassoli, S. (2018). The role of product innovation on export behavior of firms. European Journal of Innovation Management, 21(2), 294-314. doi:10.1108/EJIM-12-2016-0124
Tran, H. T., & Santarelli, E. (2013). Determinants and Effects of Innovative Activities in Vietnam. A Firm-Level Analysis. Quaderni - Working Paper DSE N° 909. doi:https://dx.doi.org/10.2139/ssrn.2338463
Tripsas, M. (1997). Unraveling the Process of Creative Destruction: Complementary Assets and Incumbent Survival in the Typesetter Industry. Strategic Management Journal, 18, 119-142.
Tushman, M. L., & Anderson, P. (1986). Technological Discontinuities and Organizational Environments. Administrative Science Quarterly, 31(3), 439-465. doi:10.2307/2392832
Van Reenen, J. (1997). Employment and Technological Innovation: Evidence from U.K. Manufacturing Firms. Journal of Labor Economics, 15(2), 255-284. doi:http://dx.doi.org/10.1086/209833
Vernon, R. (1966). International Investment and International Trade in the Product Cycle*. The Quarterly Journal of Economics, 80(2), 190-207. doi:10.2307/1880689 %J The Quarterly Journal of Economics
Verwaal, E., & Donkers, B. (2002). Firm Size and Export Intensity:

Solving an Empirical Puzzle. Journal of International Business Studies, 33(3), 603-613.

Waheed, A. (2012). Innovation Determinants And Innovation As A Determinant: Evidence From Developing Countries. Phd Thesis. . Maastricht University, Retrieved from https://www.merit.unu.edu/training/theses/Waheed_abdul.pdf.

Wakelin, K. (1998). The role of innovation in bilateral OECD trade performance. Applied Economics, 30(10), 1335-1346. doi:10.1080/000368498324959

Wall, T. D., & Wood, S. J. (2005). The romance of human resource management and business performance, and the case for big science. 58(4), 429-462. doi:10.1177/0018726705055032

Waychal, P. K., Mohanty, R. P., Verma, A. K. J. I. J. o. B. I., & Research. (2011). Determinants of innovation as a competence: an empirical study. International Journal of Business Innovation and Research 5, 192-211.