The Impact of Human Capital on Innovation: Empirical Evidence from South Asian Association for Regional Cooperation (SAARC)

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South Asian Association for Regional Cooperation (SAARC) is lagging behind in terms of human capital and innovation activities. The ability to innovate depends upon the knowledge, skills, training and experience of the worker. It is widely believed that innovation drives growth and play important role in firm survival. The objective of the study was to investigate the effect of a firm's level human capital on innovation activities in South Asian Association for Regional Cooperation (SAARC) region using World Enterprise Survey data. The study utilized the multilevel logistic regression model. The innovation is measured through the survey question "during the last three years, has this establishment introduced new or significantly improved products or services" and the human capital is measured by "proportion of skilled workers out of all production workers". The results of the multilevel logistic model indicate that human capital has positive impact on the innovation.

Key words: *Human Capital, Innovation, South Asian Association for Regional Cooperation*

1. Introduction

It is widely believed that innovation drives growth at macro level and improves firm's productivity and performance at micro level. The implementation of new ideas drives competition and augments firm's growth. (Ganotakis, 2012). The capacity to innovate creates comparative advantage for the firm. In recent years, trend in enterprise sector moves towards innovation-driven competition (Kuhlmann & Edler, 2003; Santamaría et al., 2012). The human capital is vibrant determinant of innovation. The knowledge, skill and experience of worker augment innovation activities through creativity and efficient allocation of resources. The human capital play effective role in improving economic development and firm's performance in economic downturn.

Over the last couple of decades, a considerable body of research has identified several influential determinants of innovation ranging from firms' specific factors, such as age of the firm, size of the firm, ownership structure and sectors of the firm (Audretsch & Feldman, 1996; De Marchi, 2012; Fagerberg et al., 2012; Jordan & O'leary, 2008; Roper et al., 2008; Tether, 1998) to institutional and bureaucratic factors (Anokhin & Schulze, 2009; Damanpor, 1996; Imran et al., 2020; Veracierto, 2008). In general, less consideration has been paid to human capital. Despite the abundance of empirical evidence, the search for discovering the factors that augment innovation is still an attractive area of research.

The literature on innovation demonstrates the significance of the macroeconomic factors by adopting the strategy of outward-oriented development, such as R&D (De Marchi, 2012; Wang & Kafouros, 2009), international trade (Wei & Liu, 2006) and country characteristics (Becheikh et al., 2006; Souitaris, 2003). Wang & Kafouros (2009) discouraged outward oriented policies and advised the firms to adopt performance enhancing microeconomic mechanism. This study emphases on the intangible characteristics of employee' human capital significant determinants for innovative activities (Coronado et al., 2008). Firms' innovative activities heavily depends upon the education, skill and training of the workers (McGuirk & Jordan, 2012). Literature documented that the likelihood of innovation activities increases with efficient leadership (García-Morales et al., 2012; Herrmann et al., 2006), information sharing , strategies and organizational skills (Hitt et al., 2001; Peeters & de la Potterie, 2006).

The objective of the study is to investigate the effect of firm level human capital on innovation activities in South Asian Association for Regional Cooperation (SAARC) region using World Enterprise Survey data. The literature provides significantly few empirical evidences on the aspect of firm level human capital (Coronado et al., 2008; Herrmann et al., 2006). The current study contributes to literature on innovation with particular focus on the human capital level such as education, skill, training and experience of the worker. To the best of our knowledge none of the study has explored this aspect of innovation with special

reference to South Asian Association for Regional Cooperation (SAARC) region. Hence, it will be the significant addition to the existing literature.

The current study is organized as follows. The review of existing literature is provided in section 2. The data and methodology is discussed in section 3. The empirical results are in section 4 while the conclusion and policy implication are mentioned in section 5.

2. Review of Literature

It is well documented in the literature that firms' ability to improve efficiency, productivity and to innovate depends upon the entrepreneur's abilities and their innovative behavior through knowledge and skills (He & Wong, 2012; Love et al., 2011; Roper et al., 2008). Management experience and skill workforce influence innovation positively and increase the possibilities to exploit knowledge (Cohen & Levinthal, 1990; Cuijpers et al., 2011). Moreover, employees with skilled human capital upsurge creativity and innovation (Kang et al., 2007; Lepak & Snell, 1999). Innovation performance depends upon the adoption of improved and advance manufacturing technologies (Abrunhosa & Sá, 2008; Santos-Vijande & Álvarez-González, 2007). Furthermore, skilled workers may deliberately flinches specific business activities which reduces production cost and ultimately improve innovation (Love & Roper, 2001).

The abundant of empirical literature inspected the impact of human capital from macro and micro level track. It is a significant factor for growth and with abundance of human capital sustainable growth can be attained at macro level (Storper & Scott, 2009). At micro level, the investment in human capital positively impact productivity and growth of the firm (Ahuja, 2000; Gössling & Rutten, 2007; Peng et al., 2008; Subramaniam & Youndt, 2005). McGrath (2001) found the positive relationship between the learning and innovative capacity. The optimal allocation of resources by adopting dominants strategy for the betterment of the business entirely depends upon the vision of the skilled entrepreneur (Santos-Vijande & Álvarez-González, 2007). Goll et al. (2008) proved the positive impact of management characteristics on business strategy and performance in airline industry. Wong (2013) investigated the role of management involvement in innovation and found the positive impact of managerial participation on technical and organizational innovation. Heyden et al. (2017) found that managerial age and experience are significant indicators of managerial characteristics and have positive impact on research and development investment in US manufacturing firms. The empirical evidence suggested that the skill and education of entrepreneur initiate creativity and augment innovation (Bantel & Jackson, 1989; Daellenbach et al., 1999) greater experience and individual managerial skill leads to improve decision making and positively influence innovation activities (Ellis et al., 2015; McWilliams & Zilbermanfr, 1996).

3. Methodology

Keeping in view the multilevel nature of the firm's level innovation, the multilevel logistic regression model is used to empirically test the impact of entrepreneurial experience on firm's innovation in the case of South Asian Association for Regional Cooperation (SAARC) region. To formulate the multilevel logistic regression model level 1 & level 2 fixed predictors added.

Level 1 equation takes the following form

$$logit\ (Innovation)_{ij} = \beta_{0j} + \beta_{1j}\ X_{ij}$$

Level 2 equations can be expressed as:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}Z_j + \mu_{0j}$$
$$\beta_{1j} = \gamma_{10}$$

Combined equation is constructed by the following.

$$logit(Innovation)_{ij} = \gamma_{00} + \gamma_{01}Z_j + \gamma_{10}X_{ij} + \mu_{0j}$$

In this model, we are predicting the probability of firm's innovation activities as a function of a human capital level predictor (skilled workers) and firm-level predictor (Age of firm, size of firm, ownership of firm). In the current study it is hypothesized that human capital level predictor and firm-level predictor both have positive impact on the probability of firms level innovation activities.

Innovation is measured through WES question h1, it is described as "during the last three years, has this establishment introduced new or significantly improved products or services", it is coded as: innovation=1, otherwise=0. Human capital is measured through WES question 14a, it is described as "proportion of skilled workers out of all production workers". Manager's gender is measured through WES question b7a, it is described as "is the top manager female", it is coded as: female=1, otherwise=0. Technology license is measured through WES question e6, it is described as "do you use technology licensed from a foreign-owned company", it is coded as: Yes=1, otherwise=0. Firm age is measured through WES question b5, it is described as "in what year did this establishment begin operations". The age is calculated through formula "survey year-year of starting operation". Firm size measured through WES question a6a, it is described as "the number of permanent workers" (small= worker > 5 and < 20; medium= worker > 20 and < 99; large= worker >100), it is coded as small firm are assumed 0, otherwise 1. The ownership of the firm measured through WES question e6, it is described as "firms that have owned by foreign individuals, companies or organizations", it is coded as foreign firm are assumed 1, otherwise 0.

4. Empirical Results

The descriptive statistics are given in Table 1.

Table 1: Descriptive Statistics

Variables	INOV	HCAP	MANG	EXP	TLIC	AGE	SIZE	OWN
Mean	0.2822	0.6410	0.0713	0.1379	0.2191	21.7767	0.6612	1.0783
Maximum	1	1	1	1	1	1	1	1
Minimum	0	0	0	0	0	0	0	0
Observations	7,992	7,688	8,324	6,699	7,314	7,378	8,362	7,998

Table 2 shows the theoretical correlation. The results of correlation matrix show positive relationship between entrepreneur experience and firms level innovation activities.

Table 2: Correlation Matrix

	INOV	HCAP	MANG	EXP	TLIC	AGE	SIZE	OWN
INOV	1.0000							
HCAP	0.0469	1.0000						
MANG	0.1737	0.0231	1.0000					
EXP	0.1066	0.0339	0.3000	1.0000				
TLIC	0.2591	0.0216	0.2825	0.1339	1.0000			
AGE	0.1559	0.3636	0.1019	0.1408	0.1091	1.0000		
SIZE	0.1334	0.0577	0.1528	0.1298	0.2428	0.0986	1.0000	
OWN	0.1207	0.0017	0.0646	0.0021	0.1284	0.0439	0.0170	1.0000

Table 2 shows the correlation analysis. It indicates that human capital is positively correlated with the innovation. The results of the correlation matrix also indicate that exports is positively related with innovative activities of the firm. Similarly the technology license, age of the firm, size of the firm and ownership of the firm also positive correlated with the innovative activities of the firm.

Table 3: Result of the Multilevel Logistic Regression Model

Variable	Probability	Std. Error	T-Statistic	Prob.
Human Capital (HCAP)	0.682644	0.038763	17.61064	0.0000
Manager's Gender (MANG)	0.002259	0.004039	0.559188	0.5765
Exports (EXP)	0.320912	0.105523	3.041167	0.0026
Technology License (TLIC)	0.319815	0.076294	4.191865	0.0000
Age of firm (AGE)	1.126949	.0858279	13.13	0.000
Size of firm (SIZE)	.0138144	.0027906	4.95	0.000
Ownership of firm (OWN)	0.617229	0.283707	2.175587	0.0304
C	0.274616	0.234022	1.173462	0.2416
F-statistic	210.6066			
Prob(F-statistic)	0.0000			
Observation	7,314			

Note: *and** indicate level of significance at 5 and 10 percent, respectively.

The results of multilevel logistic regression model are shown in Table 3. In the empirical analysis the innovation is measured by categorical variable through the survey question "during the last three years, has this establishment introduced new or significantly improved products or services" and the human capital is measured through "proportion of skilled workers out of all production workers". The results of multilevel logistic model indicate that human capital has positive impact on the innovation. This result supports the findings of the Heyden et al. (2017) and Daellenbach et al. (1999). Rogers (2010) explained the reason behind the positive impact of human capital on the firm's innovation. Our results are also in line with the finding of the McWilliams and Zilbermanfr (1996). The results indicate that gender of the manager has positive impact of the innovation. The male mangers are found more passionate to work, hence more productive and more innovative. The results indicate that export of the firm has positive impact of the innovation. The exporting firms are found more productive thus augment firm's innovation. The results indicate that technology license has positive impact of the innovation. The firms that acquire technology license are more involved in innovative activities. The other control variables such as age of the firm, size of the firm and ownership of the firm shows significant positive impact on the innovative activities of the firm.

5. Conclusion

The objective of the study was to investigate the effect of human capital on innovation activities in South Asian Association for Regional Cooperation (SAARC) region using World Enterprise Survey data. The current study contributes to literature on innovation with particular focus on the human capital. The results of multilevel logistic model indicate that human capital has positive impact of the innovation. The knowledge, skill and experience of manger augment innovation activities through creativity and efficient allocation of resources. On the basis of the results of the current study it is suggested that firms should hire skilled workers. It will not only increase the productive and innovative capacity of the firm but also the profit of the firm in short run and performance of the firm in the long run.

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