The Determinants of Firm Survival among Small Cluster Firms

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Abstract

This study analyzes the impact of education, experience, and social capital on firm survival using two waves of a survey conducted in 2008 and 2017 for the electrical fittings cluster based in Sargodha, Pakistan. Estimating a probit model, we find that the entrepreneur's education, experience, and social network are each positively correlated with firm survival. The interactions of education with both production and marketing experience are also significantly and positively related to firm survival while interactions of social capital with experience are not. Therefore, for the firms in this sector, education plays an important role directly as well as through production and marketing experience.

Keywords: Education, experience, social capital, firm survival, Pakistan.

JEL classification: J24, L26, L69.

Introduction

Small and medium-sized enterprises (SMEs), especially those in clusters, can be part of a strategy to support inclusive and sustainable industrial development in developing countries (Schmitz and Nadvi, 1999). However, the death rate among new firms in developing economies is very high: around 50 percent of all new manufacturing firms close down within the first 5 years, and only 20 percent survive longer than 10 years (Audretsch and Mahmood, 1995; and Ebert et al., 2018). McKenzie and Paffhausen (2017) report that small firms die at an average rate of 8.3 percent per year over the first 5 years in developing countries. Given this situation, firm survival has become an important research question in the developing country context (Cefis and Marsili, 2005; Box, 2008; Fontana and Nesta, 2010).

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The empirical literature has shown firm performance to be correlated with both human capital and social capital (Santerelli and Tran, 2013). Human capital is not only based on education, but also comprises experience that a person attains by means of participation in work activities such as production and marketing. Education and experience, when combined, have been shown in the literature to be complements in firm performance (Iversen et al., 2016).

Our study collects data from the electrical fittings cluster in Sargodha, Pakistan to study firm survival. The two surveys, conducted in 2008 and 2017, contain data on the entry and survival of 232 enterprises formed within the electrical fittings cluster between 1967 and 2008. The econometric strategy employed is a probit regression, where we aim to investigate the effect of the interaction of education, experience, and social capital on firm survival in the cluster.

The rest of the paper is organized as follows: Section 2 offers a literature review. Section 3 reports on the dataset and its descriptive analysis. Section 4 discusses the model specification and results. Finally, conclusions are provided in last section.

Literature review

Human capital is made up of a variety of skills and knowledge accumulated through education, experience, and training (Unger et al, 2011). Mincer (1976) and Becker (1964) were pioneers of this concept in economics, and for decades human capital has been recognized as playing a critical role in entrepreneurial performance (Unger et al., 2011). Studies in this area have emphasized principally the *entrepreneurs'* human capital (Unger et al. 2011). The term human capital contains both specific as well as general human capital (Becker, 1993). Various studies have focused individually on both types - general and specific human capital - in entrepreneurship research (Bruderl et al., 1992; Gimeno et al, 1997; and Ucbasaran et al., 2008), and find both to have positive effects on firm performance.

Explicit knowledge is gained through education and tacit knowledge is gained through experience (Davidsson and Honig, 2003). Education is useful to entrepreneurs as it is an accumulation of explicit knowledge that may provide useful information, including the identification of new opportunities. Formal education produces general human capital (Davidsson and Honig, 2003), and while higher expenditures on formal education are expected to produce higher payoffs, non-linear effects have

been observed empirically (Evans and Leighton, 1989; and Gimeno et al., 1997). In particular, a number of empirical studies have shown the positive effect of education on firm survival (Bates, 1990; Dahlqvist et al., 2000; and Block and Sandner, 2009).

Specific human capital might affect firm survival in the same way as general human capital. Prior experience plays a useful role in enterprise performance and helps in the accumulation of new knowledge (Weick, 1995). Bruderl et al (1992) used a sample of German firms to conclude that both types of human capital – education and experience of the founder – have strong effects on the success of businesses. Experienced entrepreneurs are able to use their prior knowledge to ensure firm survival (see, e.g., Wilbon, 2002; Cantner et al., 2006), but also have greater ambitions for their firms in terms of intended venture size (Cassar, 2006).

From an entrepreneurial perspective, social capital provides entry into networks that facilitate the exchange of scarce resources (Greene and Brown, 1997; and Uzzi, 1999). During the innovation process, social capital assists in exposing the entrepreneur to new ideas and can help them in identifying new opportunities (Elfring and Hulsink, 2003), organizing and mobilizing resources (Stam et al., 2014), and building legitimacy for their firms (Elfring and Hulsink, 2003). Social capital also enhances the flow of information upon which entrepreneurs base decisions. Personal networks can also provide valuable resources in the form of formal and informal information and finance. Social capital gives an edge to survival in business, creating thickness in business ties that can help achieve that most fundamental goal, that is, of firm survival (Litzel, 2016). Family firms, internally dense with social capital, are also more likely to survive although their productivity growth is poorer (Morikawa, 2013).

Lastly, we consider the interaction between social and human capital as a driver of firm performance. Sonobe and Otsuka (2006) used case studies of East Asian firms to examine the joint influence of human and social capital on firm survival in clusters. Using the data for Vietnam entrepreneurs, Santarelli and Tran (2013) showed that factors related to human and social capital, individually as well as combined, have an influence on operating profit.

Table 1 is provides summary of firm survival literature related to human capital, social capital and firm characteristics including size and age.

Table 1: Overview of firm survival literature

Characteristic	Authors and year	Country	Industry	Sample size	Relationship with survival?
Human capital	Wilbon (2002)	USA	Mixed [NC]	95	Positive
	Cantner et al. (2006)	Germany	Automobile [C]	441	Positive
	Saridakis et al. (2008)	England	Mixed [NC]	622	Positive
	Wennberg and Lindqvist (2008)	Swedish	Mixed [C]	4397	Positive
Social capital	Watson (2007)	Australia	Mixed [NC]	5027	Positive
	Morikawa (2013)	Japan	Mixed [NC]	4466	Positive
	Litzel (2016)	Germany	Mixed [NC]	88855	Positive
Firm age	Cefis and Marsili (2005)	Netherlands	Mixed [NC]	3275	Positive
	Alvarez and Vergara (2013)	Chile	Mixed [NC]	16752	Positive
	Coad and Guenther (2013)	Germany	Machine tool [NC]	2000	Positive
	Esteve-Pérez et al.(2017)	Spanish	Mixed [NC]	4546	Positive
Firm size	Fotopoulos and Louri (2000)	Greek	Mixed [NC]	1115	Positive
	Box (2008)	Sweden	Mixed [NC]	2200	Positive
	Strotmann (2007)	Germany	Mixed [NC]	2605	Positive
	Audretsch et al. (2016)	China	Mixed [NC]	3000	Positive
	Huggins et al. (2017)	U.K	Mixed [NC]	3251	Positive

Notes: C stand for cluster and NC stand for non-cluster industry.

Data overview and descriptive analysis

Sargodha is located in the Punjab province of Pakistan and it is interconnected with other well-established centers of industrial clusters such as Faisalabad, Gujarat, Gujranwala, and Sialkot, which are famous for textiles, plastic products, metal products, sports goods, light machinery and surgical instruments. Sargodha in particular has become known as a cluster where a large number of SMEs produce electrical fittings. Therefore, primary data was collected from the electrical fittings cluster based there. The first wave of the survey was conducted by Arif and Sonobe (2012) in 2008. The second wave of the survey has been conducted in 2017. The data collection method consisted of personal interviews of the executive officer or firm owner of the enterprises and subcontractor workshops. The major difficulty encountered in conducting the survey was the listing exercise of the census of enterprises, since the Sargodha regional

offices of the Small and Medium Enterprises Development Authority (SMEDA) and Pakistan Bureau of Statistics (PBS) did not have a reliable list of electrical fittings firms.

According to the list of SMEs provided by the Arif and Sonobe (2012), 126 enterprises worked as manufacturers and 106 as subcontractors, to comprise a total sample of 232 firms surveyed from the cluster. We revisited the same enterprises during 2017, and found 92 enterprises had been closed down while 140 firms survived in the industry.

The entrepreneurs of Sargodha's electrical fittings cluster have a moderate level education but are rich in prior production experience. The cluster is characterized by similar social backgrounds and the majority of entrepreneurs come from the local area's majority ethnic group. There are also strong family networks within the cluster. Interestingly, second-generation entrepreneurs have moved into trading, marketing, and other related activities of the electrical fittings cluster.

Table 2: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Firm survival	232	0.603	0.490	0	1
Owner education	232	7.68	3.864	0	16
Production experience	232	0.685	0.465	0	1
Marketing experience	232	0.125	0.159	0	1
Friends and relatives in same industry	232	2.125	4.784	0	35
Parents in same business	232	0.039	0.194	0	1
Birth place in Sargodha	232	0.879	0.326	0	1
Ethnic majority	232	0.272	0.446	0	1
Owner age	232	40.03	9.90	22	70
Firm size	232	10.31	16.54	1	216
cohort $_{upto\ 1980}$	232	0.039	0.194	0	1
cohort $_{1981-1990}$	232	0.133	0.340	0	1
cohort $_{1991-2000}$	232	0.297	0.458	0	1
cohort $_{2001-2008}$	232	0.530	0.500	0	1

Table 2 provides descriptive statistics for all firms. Firm survival will be the outcome of interest in the econometric model. About 60 percent of firms survived from 2008 until 2017 in the cluster. The average level of owner education is 7.86 years. In particular, 69 percent of the owners have prior production experience, while 13 percent have marketing experience.

Each entrepreneur has, on average, 2 friends and relatives (FRs) in the same industry. Therefore, social capital is strong in the cluster. We found that 88 percent of entrepreneurs were born in Sargodha. But only 4 percent of the entrepreneurs have parents in the same business. The mean entrepreneur age for the sample is about 40 years. Firm sizes ranges from 1 to 216 with an average of 10.31 employees. Table 1 also reports the four birth cohorts of the sample firms over the study period. The first cohort, who entered between 1960 and 1980 comprise only 3 percent of firms surveyed. 13 percent of the firms come from the second entry cohort. Similarly, 29 percent of sample firms had entered as part of the third cohort, while the remaining 53 percent entered in a year between 2001 and 2008.

Table 3 shows the main difference between surviving and exiting firms. Firms that survived from 2008 until 2017 tended to have more marketing experience and their owners had more education, while exiting firms were more reliant on production experience. Similarly, surviving firms display higher levels of social capital and larger firm sizes than those that had exited by 2017.

Table 3: Characteristics of surviving firms and exiting firms, 2008-2017

	Surviving firms	Exiting firms
Number of Firms	**140**	**92**
Percentage of Firms (%)	**60.34**	**39.66**
Owner education	8.26	6.82
Production experience	0.66	0.71
Marketing experience	0.18	0.13
FRs in same industry	2.49	1.58
Parents in same business	0.03	0.04
Birth place in Sargodha	0.90	0.85
Ethnic majority	0.26	0.19
Owner age	40.03	40.02
Firm size	12.13	7.54
cohort $_{up\ to\ 1980}$	0.06	0.01
cohort $_{1981-1990}$	0.14	0.12
cohort $_{1991-2000}$	0.34	0.27
cohort $_{2001-2008}$	0.51	0.54

Source: Authors' calculations based on primary data.

Model specification and estimation results

The model we have adopted to estimate the determinants of firm survival includes conventional factors (education and experience) in addition to newer factors like the role of social networks. The main purpose of our study is to empirically examine how education, experience, and social capital relate individually to firm survival as well as if there are any interaction effects between these factors.

We start with the base econometric model specification in equation 1 which exhibits the separate effects of education, experience, and social networks on firm survival.

$$FS_i = \beta_0 + \beta_1 Edu_i + \beta_2 Exp_i + \beta_3 Sc_i + \beta_i Z_i + \epsilon_i \tag{1}$$

where *FS* represents firm survival, *Edu* is the firm owner's education level, *Exp* is for prior production and marketing experience, *Sc* is social network, and *Z* is vector of control variables which include owner age, firm size and cohort dummy variables, and ϵ_i represents robust error term, and *i* denotes firms. *FS* equals 1 if firms survived between 2008 and 2017, and 0 otherwise. On the right hand side, we have three categories of variables: human capital (education, production experience, and marketing experience), social capital (prior number of FRs in same industry, ethnic majority, father is same industry, and birth place in Sargodha), and control variables (owner age, firm size, and dummies of cohort variables). These variables are either dummy or count in nature. Given the binary nature of the dependent variable, *FS*, the regression is run with the probit model.

Next, we incorporate interaction terms into the model since the probability of firm survival may be boosted when education is complemented with experience and social capital. Therefore these additional interactions terms are added in the model in equation 2: *Edu×Exp*, *Edu×Sc*, and *Exp×Sc*, respectively. We represent these interactions in the following probit regression model:

$$FS_i = \beta_0 + \beta_1 Edu_i + \beta_2 Exp_i + \beta_3 Sc_i + \beta_4 Edu \times Exp_i + \beta_5 Edu \times Sc_i + \beta_6 Exp \times Sc_i + \beta_i Z_i + \epsilon_i \tag{2}$$

Table 4 presents our results for firm survival, estimating equations 1 and 2 using a probit model. The entrepreneur's education is positively and significantly related to firm survival in all specifications. Both prior

production experience and prior marketing experience are also positively and significantly correlated with firm survival. This implies that entrepreneurs with backgrounds in either production or marketing are more likely to survive. Overall, only one of the social capital variables is statistically significant in relation to firm survival, which is the number of friends and relatives in the same industry. It should be noted that the results described here are correlations and should not be interpreted causally, since important unobserved variables, including entrepreneurial ability and intelligence, would be positively correlated with both observed education, experience, and firm performance.

Table 4: Determinants of Firm Survival

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Owner education	0.049**	0.053**	0.0528**	0.0574**	0.0492**	0.0503**
	(0.025)	(0.025)	(0.025)	(0.026)	(0.025)	(0.025)
Production experience	0.427**	0.522*	0.423**	0.431**	0.446*	0.423**
	(0.208)	(0.301)	(0.210)	(0.209)	(0.243)	(0.209)
Marketing experience	0.889*	0.988*	2.482***	0.895*	0.888*	1.068*
	(0.533)	(0.516)	(0.771)	(0.543)	(0.523)	(0.553)
FRs in same industry	0.047**	0.045*	0.041*	0.092**	0.070**	0.042**
	(0.022)	(0.024)	(0.022)	(0.044)	(0.034)	(0.021)
Parents in same business	-0.202	-0.140	-0.209	-0.190	-0.242	-0.208
	(0.460)	(0.497)	(0.463)	(0.462)	(0.471)	(0.462)
Birth place in Sargodha	-0.0512	-0.076	-0.062	-0.044	-0.049	-0.067
	(0.264)	(0.265)	(0.265)	(0.265)	(0.265)	(0.268)
Ethnic majority	-0.139	-0.193	-0.130	-0.161	-0.139	-0.130
	(0.201)	(0.204)	(0.201)	(0.202)	(0.201)	(0.203)
Owner education × production experience		0.112**				
		(0.053)				
Owner education × marketing experience			0.204**			
			(0.084)			
Owner education × FRs in same industry				0.006		
				(0.005)		
Production experience× FRs in same industry					0.086	
					(0.061)	
Marketing experience× FRs in same industry						0.261
						(0.232)
Owner age	0.0014	0.013	0.012	0.012	0.012	0.013
	(0.010)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Firm size	0.0295***	0.0296***	0.0296***	0.0292**	0.0251**	0.0290***
	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)	(0.011)
Cohort $_{1981-1990}$	1.088*	1.127**	1.116**	1.068*	1.101**	1.097**
	(0.558)	(0.538)	(0.559)	(0.562)	(0.560)	(0.558)
cohort $_{1991-2000}$	1.043*	1.074**	1.049*	1.020*	1.060**	1.041*
	(0.537)	(0.520)	(0.536)	(0.538)	(0.540)	(0.536)
cohort $_{2001-2008}$	-0.897*	-0.896*	-0.896*	-0.924*	-0.941*	-0.892*
	(0.540)	(0.523)	(0.510)	(0.544)	(0.543)	(0.520)
Constant	0.461	1.339	0.493	0.340	0.604	0.488
	(0.893)	(0.975)	(0.894)	(0.910)	(0.910)	(0.896)
Pseudo R^2	0.167	0.182	0.172	0.170	0.174	0.168
Observations	232	232	232	232	232	232

Notes: The dependent variable is firm survival and results are taken from a probit regression. Heteroskedasticity robust standard errors are in parentheses. Significance of coefficients at the 10%, 5%, and 1% levels are shown by *, **, and ***, respectively

In columns (2) through (6), interactions between education, experience and social network variables are also included, one by one. The interaction of both types of experience with education are positive and significantly related to survival, while at same time the significance of the individual effects (education and experience) are maintained.   These findings suggest that not only are business experience and education individually important but that experience is enhanced by the entrepreneur's education in relation to the survival probability of firms. On the other hand, while the effects of social capital interacted with education and experience have the expected (positive) direction, they were not statistically significant.

The results also show a positive relationship between the firm size and the survival probability. This finding is also supported by earlier results that have claimed that survival rate of large firms is more as compared to small firms (Fotopoulos and Louri, 2000; and Audretsch et al., 2016).   It may be the case that larger firms are more able to weather economic instability and survive, but this result cannot in general be interpreted as a causal relationship.   Firm size is likely to be correlated with unobserved firm characteristics, especially total factor productivity, that increase both firm size and chances of survival.

The analysis also included birth cohort dummies in the estimation. In general, the youngest cohort of firms, founded since 2000, were the least likely to survive and the firms in the second and third cohorts were more likely to survive between 2008 and 2017 in comparison to the first (oldest) cohort, although the latter represented only a very small number of firms, making it difficult to generalize. While it is tempting to suggest that older firms are more likely to survive due to the depth of their experience, these results cannot typically be interpreted in this way since the sample analyzed here is a selected one: the majority of firms founded in those earlier periods had already exited, and only the most productive firms from the older cohorts would have survived until 2008 in order to be included in the sample. Because they are more productive (and not because they are older), older firms are more likely to survive until 2017 as well.

Conclusions

Small, young firms in Pakistan, as in most countries, face difficulties in survival, even in in clusters, which are supposed to be amenable to industrial development. Therefore, our study aimed to understand the characteristics of firms that do survive in this context. For

this purpose, we employed a unique dataset from Sargodha's electrical fittings cluster collected in 2008 and 2017. Using a probit model, the results revealed that higher levels of both types of human capital, that is, education and experience, as well as the size of an entrepreneurs' social network were indicators of a higher likelihood of firm survival. We found additional gains to firm survival probabilities when education was interacted with either marketing or production experience.

These findings are in line with the modern emerging literature on industrial clusters in East Asia, South Asia, and Africa (Sonobe and Otsuka, 2006) which suggests that more formally educated and experienced entrepreneurs have positive influence on enterprises' development. The results reveal that education, production, and marketing experience individually as well as jointly have increased the life expectancy of the firm. The empirical literature also suggests that social capital is helpful in survival and our empirical findings suggest the same.

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