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RESEARCH ARTICLE

Unbundling the Influence of Human Capital on the New Venture's Performance

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Abstract: We use a longitudinal dataset on new ventures to assess the effects of human capital factors (education, work experience, and entrepreneurial experience) on new ventures' performance. Our results show how the influence of human capital factors are dependent on the context (high vs. non-high technology industries) and illustrate the different effects of general and specific human capital factors. The findings help to clarify the existing debate on the influence of human capital where we introduce a longitudinal perspective that contributes to uncover the influence of factors such as prior experience, in particular if in the same industry, as a positive influence on new ventures' future performance.

***Keywords*:** Human Capital, Entrepreneurship, Venture Performance, Panel Data

JEL Classifications: L26, M13, O30

Human capital is part of the initial set of resources of all new ventures where a combination of the entrepreneur's education and experience is expected to have been transformed into knowledge and skills that define the specific characteristics of the new venture's human capital. There is a shared assumption that human capital, as a key and single resource, has a positive influence on the new venture's performance (Unger, Rauch, Frese, & Rosenbusch, 2011).

There has been a number of researches exploring the linkages between human capital and venture performance and the results have provided a variety of insights. For example, research on the influence of prior experience has found its effects on the new

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firm's capacity to identify and exploit new business opportunities (Eesley & Roberts, 2012); or that while generic human capital (such as education) would have a negligible influence on new venture performance, specific human capital (such as entrepreneurial experience) would have positive effects (Rauch & Rijsdijk, 2013). On the other hand, other researchers could not find a significant impact either from education or work or entrepreneurial experience on new venture growth (Stuetzer, Goethner, & Cantner, 2012).

In an attempt to gain clarity through further contextualization of the findings, researchers have also studied specific knowledge intensive contexts such as high-tech industries where greater human capital is expected to provide differential capabilities to new entrants (Strehle, Katzy, & Davila, 2010). Research findings have supported the expectation that specific sources of human capital, such as entrepreneurial-specific experience or industry-specific experience, could have a significant positive impact on performance in such context (Colombo & Grilli, 2005).

As a result, despite the ongoing research on the relationship between human capital and new venture performance, we still have a limited understanding on the magnitude and contingencies of the impact of the different components of human capital on new venture performance (Unger et al., 2011). We know little on how the different components of human capital, general or specific, impact on new venture performance (measured either as revenue or employment creation), and whether these relationships are contingent to high-technology contexts, or also hold for entrants in non-high-tech industries.

Building on human capital theory (Becker, 1975), the purpose of this work is to systematically identify the relationships and effects of different human capital components in new ventures by introducing the moderating role of the context (high or non-high technology industries), and exploring the time-effects on new venture performance.

Material and Methods

The data comes from the Kauffman Firm Survey (KFS), a longitudinal panel data set that tracks a sample of new firms created in 2004 (baseline) in the US and we follow the ventures in their first three years of operations (2004-2007). For more information on the KFS survey and data design see Robb and Reynolds (2009).

For our dependent variable new venture performance, we used *revenue generation* (log of firm's revenue (M=10.28, SD=2.13)) as Model 1 and *employment creation* (log of firm's employees (M=.75, SD=.84) as Model 2 in line with prior research suggestions (Delmar, Davidsson, & Gartner, 2003). The human capital independent variables are measured using generic human capital components: *education* (1 to 10, from less than high school to professional school or doctorate), *work experience* (in number of years); and specific human capital components: *entrepreneurial experience* (number of businesses started), and *entrepreneurial experience in the same industry* (whether previous businesses started in the same industry).

The panel data design and measures used offer the possibility of overcoming two limitations: endogeneity (Colombo & Grilli, 2005) and the time lag of human capital influence (Rauch & Rijsdijk, 2013). Given that an entrepreneur's human capital factors are time-invariant, we cannot rely on the Hausman test to choose between fixed or random effects (Bell & Jones, 2015) Random Effects modelling provides everything that Fixed Effects modelling promises, and much more. Crucially it allows the modelling of time-invariant variables, and does so in a more parsimonious and explicit way than an alternative, Plümper and Troegers Fixed Effects Vector Decomposition (2007. We, therefore, introduced instrumental variables that could capture otherwise unobserved sources of variation and these are: *firm size*, *market approach* (product or service), *R&D intensity* (as % of employees in R&D function), and *number of patents* (Garcia-Castro, Ariño, & Canela, 2010). We were able to capture the time lag in the effects of an entrepreneur's human capital (as a time-invariant input variable) by observing the changes in the first wave of data (wave 1) and three years after (capturing the changes across wave 1 to wave 3).

The sample classification between high and non-high technology contexts is done by selecting the industries that are classified as technology employers (Chapple, Markusen, Schrock, Yamamoto, & Yu, 2004) or technology generators (Paytas & Berglund, 2004) as suggested by Coleman & Robb (2012). Control variables for the *age* and *gender* (where 1 is male, and 0 is female) of the entrepreneur, and *time* (data wave years) are also introduced.

Empirical Analysis and Results

We run a regression analysis using random effects (RE) for the two measurements of the dependent variables (described as Model 1 and Model 2 in Table 1), the correlation between revenues (log) and number of employees (log) is 0.47. For each of the models, we run a separate analysis for firms classified as high technology new ventures and for those classified as non-high technology new ventures. We also run a separate test for the first data wave (one year after) and the third data wave (three years after).

The Chi^2 test for all the regression analyses provided support to assume that none of the coefficients would be 0 ($Prob>Chi^2 = 0.00$). The overall R^2 of the different models provides a measure of the influence of human capital factors and the time effects on the performance of the new venture ($0.18 <$ overall $R^2 < 0.35$). The between R^2 shows that the between firm's differences explain better the variability of the revenue's growth (Model 1b: $0.26 <$ between $R^2 < 0.33$) and employees' growth (Model 2b: $0.32 <$ between $R^2 = 0.34$).

The descriptive statistics and regression results can be seen in Table 1. Model 1 (revenues as performance measure) shows the positive influence of education on high-tech firms' revenues. For the non-high-tech firms, it shows a weak, but significant, influence of entrepreneurial experience, but a stronger positive influence from entrepreneurial experience in the same industry. Model 2 (number of employees as performance measure) shows a weak but positive influence of education (both in Model 2a and 2b), and weak influence of entrepreneurial experience in the three-year data (Model 2b) on high-tech firm's number of employees. For non-high-tech firms, the results show the influence of specific human capital factors with a weak but positive effect of *entrepreneurial experience* and a stronger positive effect of entrepreneurial experience in the same Industry.

Overall, we find support on the influence of human capital factors on new venture performance, but this support is not consistent across all the different factors (general or specific) that were studied as well as the different models that were explored. This suggests that part of the current debate on the influence of human capital factors can now be now clarified. While general factors, such as education, are seen to have some influence on high tech context startups, it is the specific factor entrepreneurial experience that makes a difference in explaining performance difference between firms in non-high-tech contexts. Consistent across the models and contexts studied, work experience does not have a statistically significant influence.

The instrumental variables provide additional information on the influence of the firm's size impacts on new venture performance, but the coefficients are either of similar magnitude or weaker than the direct impact of human capital factors in non-high-tech firms (Model 1a/1b). The type of firm, by R&D focus or the market approach (product/service), provides additional information to other sources of influence on new venture performance.

Discussion and Conclusion

This article contributes to entrepreneurship research on new venture performance by providing further insights into the influence of human capital factors. First, using general (education and work experience) and specific human capital factors (entrepreneurial experience and entrepreneurial experience in the same industry), we can assess and compare their effects on different contexts (high vs. non-high technology industries). Second, the longitudinal research design and the use of two measures for the performance dependent variable overcomes a limitation from prior research in the area (Rauch & Rijsdijk, 2013), and provides additional confidence in the observed results in relation to prior studies. As a result, this research findings on the different effects of general and specific human factors on high-tech and non-high-tech new ventures contribute to clarify the different findings of previous studies that do not differentiate across contexts (Unger et al., 2011) or that had their findings limited to high-tech firms (Colombo & Grilli, 2005).

Furthermore, we find that the results have implications to advance the discussion of human capital for new venture performance. We were able to clarify the effects of general and specific human capital depending on the context of the firm. Human capital factors such as education or experience are seen to have an influence (or not) on new venture performance. In addition, we were able to decipher the time lag effects of initial human capital by observing that effects are sustained across time and contribute to explain differences in performance beyond the first year.

Table 1. *Regression Results From Human Capital Factors on New Venture Performance (2004-2007)*

			Model 1: Reg. Estimation for Revenues								Model 2: Reg. Estimation for Employees							
			1a) Wave 1: 2004-2005				1b) Waves 1-3: 2004-2007				2a) Wave 1: 2004-2005				2b) Waves 1-3: 2004-2007			
			High-Tech		Non High-Tech		High-Tech		Non High-Tech		High-Tech		Non High-Tech		High-Tech		Non High-Tech	
	Mean	*SD*	*Coef.*	*S.E.*	*Coef.*	*S.E.*	*Coef.*	*S.E.*	*Coef.*	*S.E.*	*Coef.*	*S.E.*	*Coef.*	*S.E.*	*Coef.*	*S.E.*	*Coef.*	*S.E.*
Education	6.45	2.07	.15*	.08	-.07**	.03	.13*	.07	-.04	.03	.07*	.04	.00	.01	.09***	.03	-.01	.01
Work Experience	12.98	10.96	-.00	.02	.00	.01	.00	.01	.00	.01	-.01	.01	-.00	.00	-.01	.01	-.01**	.00
Entrepreneurial Experience	.85	1.27	-.01	.11	.12**	.05	-.02	.09	.13***	.04	.07	.05	.07***	.02	.07*	.04	.06***	.02
Entrep. Exper. same Industry	.40	.49	.11	.29	.43***	.15	.23	.26	.52***	.12	.10	.13	.21***	.06	.09	.11	.19***	.05
Age	45.93	10.98	.01	.02	.01	.01	.02	.01	.00	.01	.00	.01	.00	.00	.00	.01	-.00	.00
Gender	.73	.44	-.13	.47	.43***	.16	.34	.40	.45***	.14	-.11	.21	.04	.07	-.09	.17	.02	.06
Size (log employees)	.75	.84	.29***	.05	.42***	.03	.40***	.04	.42***	.02								
Size (log revenues)	10.28	2.13									.13***	.02	.07***	.01	.11***	.01	.09***	.00
R&D intensity	.31	.39	-.76	.56	-.41**	.18	-.97**	.46	-.41***	.15	-.62**	.24	-.72***	.07	-.73***	.19	-.76***	.07
Patents	.04	.19	.34***	.11	.31***	.12	.35***	.10	.30***	.08	.08	.07	-.20***	.05	.14***	.05	-.07**	.03
Product	.51	.50	.20**	.08	-.34***	.06	-.06	.07	-.09**	.04	-.01	.05	.17***	.02	-.01	.03	.11***	.01
Service	.84	.36	.53***	.14	.17**	.07	.12	.09	.10**	.05	.24***	.08	.08**	.03	.40***	.05	.01	.02
2005			.77***	.04	.58***	.02	.72***	.05	.58***	.03	.31***	.09	.19***	.01	.35***	.03	.19***	.01
2006							.82***	.05	.91***	.03					.41***	.03	.20***	.01
2007							1.04***	.05	.92***	.03					.37***	.03	.20***	.01
Constant			8.4***	.94	9.98***	.39	8.59***	.80	9.86***	.32	-1.16	.44	-.03	.17	-1.27***	.35	.06	.15
Chi2 =			*651.8*		*1283.24*		*871.32*		*2759.31*		*414.67*		*1077.30*		*848.54*		*1551.98*	
Prob > chi2 =			*0.00*		*0.00*		*0.00*		*0.00*		*0.00*		*0.00*		*0.00*		*0.00*	
R2 (overall)			0.26		0.18		0.35		0.25		0.32		0.27		0.34		0.31	
R2 (within)			0.36		0.17		0.26		0.18		0.24		0.13		0.25		0.09	
R2 (between)			0.24		0.17		0.33		0.26		0.31		0.27		0.34		0.32	
n			*153*		*724*		*177*		*841*		*153*		*724*		*177*		*841*	

*Notes: *p < 0.1, **p < 0.05, ***p< 0.01*

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