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The role of education and learning by experience in the performance of Microenterprises

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Abstract

This paper evaluates the role of human capital in the productivity performance of Mexican microenterprises by estimating productivity functions using standard econometric techniques. Two sources of human capital are analyzed: formal education acquired at educational institutions and business experience of the entrepreneurs. The data is originated from a sample of microenterprises operating in challenged neighborhoods of the Mexican province of Baja California. The estimated productive structure of the enterprises in the sample and the effects of human capital, suggest that this source of capital plays a role not only in terms of determining the productivity level across enterprises but also in enhancing long run productivity, bringing some implications about the sources of productivity available in these enterprises and the orientation of the entrepreneurship policies for developing countries.

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Keywords: microenterprises, productivity, human capital, production functions, experience, education

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1. Introduction

Microenterprises (MEs) accounts 5.35 million, representing 95% of the enterprises in Mexico. Literature suggests that these enterprises face institutional, market, productive, financial and human capital constraints. This paper relates to the later issue: the role played by formal education acquired at educational institutions and business experience of entrepreneurs in the productivity performance of MEs. This is an application that had escaped economic literature despite the proliferation of such enterprises in developing countries. The analysis was performed in a sample of Mexican MEs operating in challenged neighborhoods of the Mexican province of Baja California. Findings of the paper reveal the sources of productivity available in these enterprises and about the orientation of the entrepreneurship policies to empower disadvantaged individuals in developing countries with improved learning for their livelihood.

2. Literature review

The pioneering contributions of Becker (1961) and Shultz (1962) defined human capital as all resources invested on people, emphasizing aspects such as job training, schooling, experience, and other knowledge whose returns could be captured by employees in higher wages and by enterprises in higher productivity. Studies on this ground have linked human capital to some entrepreneur variables such as allocative efficiency (Fane, 1975; Huffman 1977; and Stefanou & Saxena; 1988), business success or duration (Bates, 1987 & Bates, 1990), enterprise growth (Liedholm, 2002) and profitability performance (Honig, 1998). With regard productivity, Barron et al. (1987) and Bishop (1994) found that training provided by employers increased the productivity as perceived by the workers; Bartel (1989, 1992) found that training increased actual and future productivity, and Mungaray and Ramirez (2007), suggest that formal education and experience of the owner in management boosted productivity. A similar result relating to education was provided by Black & Lynch (1996) who suggest that average schooling level has a positive and significant effect over productivity. In Mexico, studies linking human capital and performance variables at firm level are not numerous particularly those relating to self-employees and MEs. One is Hernandez-Trillo et al. (2005) who estimated the contribution of schooling and business experience on technical inefficiency in MEs, finding both negative and statistically significant; another is Mungaray et al. (2008) who found positive effects on MEs cost curves derived from extensions programs. One last work is McPherson (2012), who provides evidence that the accumulation of human capital of Mexican MEs proprietors is positively associated with the growth performance of their businesses.

3. The Data, Empirical Approach and Results

3.1 Remarks about the microenterprises of the sample

Data was obtained from a surveying 5,524 MEs owners in the state of Baja California Mexico during the period 2009-2010, targeting either self-employees or MEs with up to 10 employees. The sample procedure restricted to marginalized neighbourhoods, thus inferences are applicable to MEs in developing countries where MEs proliferate. The MEs by enterprise type is as follows: street vendors (26%), streets workshops located at fixed sites on sidewalks (20%), home workshops (23%) and independent workshops in formal establishments (23%), the rest is unspecified. As for the industry, the MEs operate mainly in trade (48%) such as selling groceries, food and beverage, sale of new or second hand clothing and personal apparel; service activities, such as preparation and sale of food products or personal services (36%); manufacturing such as food processing, and making of textiles, leather and apparel products (11%), and the rest 5% is unspecified. The MEs produce on average about 8.2 thousands pesos per month (about 648 US dollars, using the 12.62 parity peso-dollar which prevail before recent markets volatility) and 8.9 thousands pesos of physical assets (about 707 US dollars), but data exhibit a great dispersion. The number of employees working in these enterprises averages 1.37 with a standard deviation of 1.07, and a median of 1, which suggests that the typical enterprise in the sample is a self-employee. Description of human capital characteristics of the MEs in the sample is provided in table 1, which contain schooling, experience and age of the entrepreneurs.

Table 1. Human capital characteristics of MEs in sample

Statistic	Schooling level	Business experience	Age
Mean	2.27	3.18	38.38
Stand. Dev.	1.43	5.71	12.78
Median	2	1	37
Frequencies	2611	5253	2611

Schooling: 0=No education, 1=Elementary, 2=Junior High, 3=High School, 4=Vocational, 5=College, 6=Graduate
Business experience and age: measured in years.

3.2 Estimation model and results

The role of education and experience in the productivity of the MEs under study is approached through a Cobb Douglas productivity function:

$$\ln(\frac{Y}{N})_i = \alpha(hx, hs, z) + \beta_1 s_i + \beta_2 \ln K_i + (\beta_3 - 1)\ln N_i \quad (1)$$

Where Y/N_i is per employee productivity and K_i is capital. Productivity is measured as the ratio sales-number of workers, the $\alpha(hx, hx, z)$ parameter is the constant or intercept of the regression and the variables S_i , K_i and N_i represent formal education, capital, and labor with β_1, β_2 and β_3-1 as their associated parameters respectively. Human capital is incorporated in the empirical model by using the education level and the years of business experience as a proxy of informal learning. Education is incorporated in the model in two different ways: one as an ordered variable representing schooling levels S_i: No schooling level=1, Elementary=2, Junior High=3, Vocational School=4, High School=5, Higher Education= 6; and as binary variables representing different schooling levels $\alpha(hs)$ according to the official classification of education in Mexico: h_{s0} No schooling=1, h_{s1} Basic education=1, h_{s2} Medium-Higher, *hs3* Higher=1. The years of business experience $\alpha(hx)$ are introduced in the model by using binary variables h_{x0} 0 years=1, h_{x1} 1 year=1, h_{x2} 2 years=1, h_{x3} 3 years=1, h_{x4} 4 years=1, h_{x4+} more than 4 years=1. The $\alpha(hx, hx, z)$ parameter is the constant or intercept of the regression and the variables S_i, K_i and N_i represent formal education, capital, and labor with β_1, $\beta_2$and $\beta_3$as their associated parameters respectively. The constant term $\alpha(hx, z)$ is assumed to be dependent upon the part of human capital accumulated in the enterprise, which can be attributable to business experience of the owner (hx) not implying a formal teaching or training; and the control effects related to geographic region, the class of activity and other specific characteristics considered in the model as z.

From equation 1, two empirical models are derived: one assuming education affecting the overall productivity function represented by the intercepts, implying its effects on overall efficiency (equation 2); the other, including schooling level as a factor of production, having a specific weight in productivity just as capital and the number of employees (equation 3). Both models assume experience (hx) as a variable affecting overall efficiency. These linear equations are estimated by using Ordinary Least Squares (OLS), testing also for heteroscedasticity.

$$\ln(\frac{Y}{N})_i = \alpha(hx, hs, z) + \beta_2 \ln K_i + (\beta_3 - 1)\ln N_i \quad (2)$$

$$\ln(\frac{Y}{N})_i = \alpha(hx, z) + \beta_1 \ln s_i + \beta_2 \ln K_i + (\beta_3 - 1)\ln N_i \quad (3)$$

The estimates β_1, $\beta_2$and (β_3-1) are the output-per-employee elasticity with respect to education, the capital-labor ratio and labor respectively. Expected signs for those are positive for education (β_1), positive for the capital ($\beta_2 > 0$) and negative for labor (β_3-1<0).From the productivity equation it is possible to derive the returns to scale exhibiting the production function as $r = \beta_1 + \beta_2 + \beta_3$. If r is greater, equal or less than 1, then the production function would exhibit increasing, constant and decreasing returns to scale respectively. Finally, the empirical models use dummy variables to control certain characteristics of the individuals in the sample represented in z, affecting the productivity function through its impact on the intercept$\alpha(hx, hs, z)$. The controls are location either urban or rural (z_1); sector either commerce (z_2), services (z_3) and manufacturing (z_4); sex of the entrepreneur (z_5); and the type of establishment:

street vendor (z_6), a street store (z_7), workshop at home (z_8), or an independent store (z_9). All these variables presumably affect the overall performance of the enterprises. Besides, the model also considers the possibility that the enterprise owner has registration in the tax office (z_{10}).

3.3 Empirical Results

Empirical results from equations 2 and 3 are exhibited on table 2. There are some missing values; nevertheless, the number of observations reached 1018 and 1059 respectively. The equations were estimated in both unrestricted, with all control variables in the term *z*, and in restricted way, excluding statistical insignificant variables in *z* at a a level greater than 0.10.

Table 2. Econometric Results

	(3)					(3) Restricted					(4)					(4) Restricted				
	Coef.		Std. error	t-stat.	Prob.	Coef.		Std. error	t-stat.	Prob.	Coef.		Std. error	t-stat.	Prob.	Coef.		Std. error	t-stat.	Prob.
z_1	-0.050		0.139	-0.360	0.718						-0.060		0.139	-0.430	0.668					
z_2	0.066		0.096	0.690	0.491						0.073		0.096	0.760	0.449					
z_3	0.045		0.093	0.480	0.633						0.051		0.093	0.550	0.583					
z_4																				
z_5	-0.084		0.060	-1.390	0.164						-0.087		0.060	-1.440	0.149					
z_6	-0.107		0.088	-1.220	0.224						-0.106		0.088	-1.200	0.231					
z_7	-0.001		0.089	-0.020	0.987						**0.009**		0.089	0.100	0.919					
z_8	**-0.149**	**	0.082	-1.820	0.070	**-0.112**	*	0.059	-1.910	0.056	**-0.144**	**	0.082	-1.760	0.079	**-0.110**	*	0.059	-1.920	0.055
z_9																				
z_{10}	**-0.147**	**	0.082	-1.790	0.074	**-0.136**	**	0.081	-1.680	0.094	**-0.145**	**	0.082	-1.770	0.077	**-0.132**	**	0.081	-1.630	0.104
h_{x0}	0.177		0.115	1.540	0.123	0.186		0.115	1.620	0.106	**0.185**	**	0.115	1.610	0.108	**0.196**	**	0.115	1.700	0.089
h_{x1}	0.199		0.124	1.600	0.109	**0.235**	*	0.124	1.900	0.058	**0.201**	**	0.124	1.620	0.105	**0.237**	*	0.124	1.910	0.056
h_{x2}	**0.241**	**	0.142	1.690	0.091	**0.244**	**	0.142	1.710	0.087	**0.245**	**	0.142	1.720	0.086	**0.250**	**	0.143	1.750	0.080
h_{x3}																				
h_{x4+}	**0.213**	**	0.122	1.750	0.081	**0.221**	**	0.121	1.820	0.070	**0.217**	**	0.122	1.770	0.076	**0.224**	**	0.122	1.840	0.066
h_{s0}																				
h_{s1}	-0.059		0.106	-0.560	0.574	-0.065		0.103	-0.630	0.529										
h_{s2}	0.092		0.117	0.790	0.430	0.105		0.113	0.930	0.352										
h_{s3}	0.213		0.152	1.400	0.162	**0.265**	**	0.149	1.780	0.075										
β_1											**0.104**	**	0.063	1.650	0.098	**0.125**	*	0.061	2.050	0.040
β_2	**0.370**	*	0.019	19.110	0.000	**0.364**	*	0.019	19.150	0.000	**0.367**	*	0.019	19.000	0.000	**0.361**	*	0.019	18.990	0.000
$(\beta_3\text{-}1)$	**-0.884**	*	0.053	-16.660	0.000	**-0.878**	*	0.052	-16.850	0.000	**-0.894**	*	0.053	-16.710	0.000	**-0.888**	*	0.053	-16.870	0.000
α(.)	**5.069**	*	0.237	21.390	0.000	**5.078**	*	0.219	23.190	0.000	**4.975**	*	0.229	21.770	0.000	**4.977**	*	0.209	23.780	0.000
Obs.	1018.00					1059.00					1018.00					1059.00				
F-stat.	43.790					68.110					49.060					81.910				
Prob F	0.000					0.000					0.000					0.000				
R2	0.430					0.420					0.420					0.410				
R2Adj.	0.420					0.410					0.410					0.410				
White Test (Chi2)	134.00					83.300					110.000					56.800				
Prob. Chi2	0.600					0.020					0.480					0.063				
Breusch-Pagan (chi2)	1.220					0.990					1.640					1.130				
Prob. Chi2	0.270					0.310					0.200					0.280				
r	0.49					0.49					0.58					0.60				

Significant coefficients at 5% (*) and 10% (**) levels are highlighted in bold letters.

Econometric results of all the equations suggest that the model is globally significant as measured by the F-stat. The goodness of fit is also acceptable (R^2= 0.41 in all cases). White test and Breusch-Pagan test suggests no evidence of heteroscedasticity. The estimates associated to capital β_2 and labor $(\beta_3\text{-}1)$ representing the shape of the productivity function in equation 2 and 3 are both significant at 5% and exhibit the expected sign: $\beta_2>0$ and $(\beta_3\text{-}1)<0$. The intercept parameter α(.) is also significant at 5% in both cases. The value of the parameters suggests that the parameter associated to labor (β_3) for all the regressions is between 0.11 and 0.13, whereas the parameter associated to capital (β_2) fluctuates between 0.36 and 0.37, which indicates the less weight of labor in productivity relative to capital. The econometric results also suggest that the underlying technology fitted to these enterprises exhibits decreasing returns to scale ($r < 1$), which suggest that productivity increases may be feasible by increasing capital relative to labor or by changing technology rather than just expanding all inputs together, but this may be subjected to capital constraints due to lack of finance

Human capital variables in h_x and h_s are in general not significant. The exception for this is the binary variable controlling for 4 or more years of experience captured by the parameter h_{4+} which turned out to be significant at

10%. In restricted regression 3, human capital variables become more significant particularly those related to experience. Hence, $h_{x1,}$ $h_{x2,}$ and h_{x4+} and higher education h_{s3} in the group of educational binary variables are significant at 10%. This entails evidence that experience after one year in business and higher education impacts overall efficiency relative to 0 years of experience and basic and median-higher education. Binary variables representing no schooling and 3 years of experience were dropped by the econometric computing package.

The specific estimation of equation 2, which incorporates education level as binary variables, suggests that z variables are not significant except for z_8 and z_{10}, which control for the conditions of operating as home workshop and being registered at the tax authority respectively. The results suggest that home workshops, which account for 31% of the analysed MEs and the largest share relative to other type of establishment in the sample, are less productive than street vendors, street stores, and independent workshops. Conversely, possessing registration in the tax authority reduces the productivity of MEs (fuzzy result since registration does not mean that the enterprise operates formally).

Estimation of model 3 generates more insights on human capital in these enterprises. This model is similar to the one on equation 2 but differs in that education is incorporated as an ordered. The results are similar to those related to regression 3 except that education as measured by S_i is significant at 10% suggesting its impact on productivity in such enterprises. Similar to equation 3, z variables are not significant except for z_8 and z_{10}, and only human capital variable h_{4+} controlling for 4 or more years of experience turned out to be significant at 10%. Once non-significant variables related to z are removed from the estimation as in the restricted regression 4, human capital variables become more significant: $h_{1,}$ $h_{2,}$ and h_{4+} are significant at 10% implying their effects on efficiency relative to 0 years of experience. Education as measured by S_i increased its significance level from 10% to 5%, therefore education as input becomes highly significant and also increases the overall significance of the model as suggested by the F-test.

The econometric results suggest that human capital plays a role in differentiating MEs in terms of their productivity. Formal education affects overall efficiency only when the entrepreneur has attained higher education, which may be indicating either that this schooling level provides more valued skills to entrepreneurs, that the goods marketed by such entrepreneurs are more valued in markets or that these entrepreneurs are advantaged in management skills. Formal education is highly significant when it enters the productivity function as a factor, implying increasing productivity associated with the entrepreneur education attainment. This may be the consequence of a set of tools acquired in schools such as writing, reading, and computations skills, which may be useful to process and analyze information and perform basic entrepreneur tasks usually done informally by the entrepreneurs and lacking of the appropriate techniques, such as budgeting, pricing, planning, costumer servicing and marketing. The owner's experience in the business also differentiates enterprises in terms of overall productivity of the organization, being more obvious after one year in business. It is worth observing that the value of the constant associated to experience goes up and then decreases as experience goes from 1 year to more than 4 years. This result may be conditioned by the interaction between age and experience in the business found in the data, which would imply that more experienced entrepreneurs are also the older ones. It also may have to do with repeating routines and getting mastery in them, facing certain set of situations where upon experience, the entrepreneur is gradually more able to solve, and the acquiring of useful information on the market in terms of competitors, consumers, inputs, and regulations. It also encompasses the improvement of consumers' knowledge and information regarding the enterprise over time affecting performance as well.

4. Concluding Remarks

This paper evaluated the role of human capital in the productivity performance of Mexican MEs under the hypothesis that education and experience of the entrepreneurs are related to their productivity performance. This hypothesis was confirmed; human capital is a determinant of the productivity level across enterprises and the long run productivity gains. Some policy implications arise from the paper findings where public and non-governmental, including higher education institutions, may play a role: increase education coverage and the average schooling level

of individuals, including efforts to reduce illiteracy and encourage students to move from elementary and junior high education toward completing vocational or high school; encourage coverage of higher education and its links to entrepreneurship; create programs aiming to transfer human capital such as the provision of business development services, which would complement formal education or compensate the lack of it, impacting the capital endowments of entrepreneurs and the enterprise performance. This type of initiatives would strengthen the skills of people to guide themselves through their productive life, before they transit to or even when they are already engaged in entrepreneurship. Policies to encourage experience and the appropriation of its returns are less obvious, but some sort of financial or non-financial programs to prevent these enterprises from a premature exit and promote surviving may work, such as tax cuts or defers, allocating subsidies during a time period after start-up, and designing financial and non-financial support programs for eligible entrepreneurs.

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