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Impact of capital structure and innovation on firm performance. Direct and indirect effects of capital structure

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Abstract

This research aims to empirically examine the impact of capital structure and innovation on firm performance among small and medium-sized (SMEs) Mexican manufacturing firms and analyze the indirect effects of capital structure to determine mediating effects of innovation. A quantitative approach and cross-sectional design were applied through the Partial Least Squares Structural Equation Modeling (PLS-SEM). A simple random sampling technique and a self-administered questionnaire was used to gather data from a sample of 220 managers or business owners in the state of Aguascalientes, Mexico. The results indicate that capital structure has a significant impact on innovation and only an indirect effect on firm performance. Due to the innovation demonstrated to have a significant full mediating role in this relationship if SMEs want to have better firm performance, they must increase their level of innovation. Therefore, decision-makers must pay special attention to the reinvestment of their profits to increase the levels of innovation and firm performance.

1. Introduction

Capital structure is one of the most important decisions when talking about corporative finance because it deals with how company finances its assets through liabilities and equity [1]. During the last decade, several international studies have researched the relationship between a company's leverage and performance [2], [3]. However, only a few studies have proved systematically the direct relationship of the determining factors of

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capital structure in its performance and whether leverage influences said relationship [4]. In this manner, with the seminal contribution of Modigliani and Miller [5], several studies have focused on this topic. According to Myers [6], we can say that there is no universal theory of the formation of the financial structure in business, and there is not a single reason to expect one. However, Stiglitz [7] established the irrelevance of the term of indebtedness and there have been three main lines of investigation that allow to the critical factors that define the capital structure to be determined- Examples of this are agency conflicts, informational asymmetry [1] and the hierarchy order [8]. We must, therefore, analyze the effect of these on corporate performance.

However, some other studies have shown that innovation is a main factor when discussing the knowledge economy and business competitiveness. As a result, innovation has become on a powerful tool for the growth of countries [9]. Innovation also helps companies to develop in a sustainable manner [10]. However, technological uncertainty is another aspect that affects innovation because it can have a negative impact or high level of risk in terms of R&D [11]. In contrast, some other studies have proved that the debt financing and capital financing have a different tolerance to this risk [12], and that theoretical contributions have made little progress in exploring how the risk capacity of a financing system affects innovation.

Therefore, this research makes a significant contribution in a field of study that has been traditionally focused on large companies in developed countries, thus producing relevant insights for Latin-American small and medium-sized companies SMEs, academics, policy and decision-makers. Accordingly, this study provides empirical evidence of the relation among the three variables of interest, especially, the direct and indirect effects of capital structure on corporate performance, by using the innovation. Moreover, the importance-performance matrix analysis (IPMA) was applied to identify the importance of each predecessor construct in terms of its total effect on the target construct.

2. Literature review

The capital structure and its effect on corporate performance is of great concern in the corporative financial literature [13]. Reaching an agreement on debt finance and development finance has been complicated even though the different studies of the topics [14]. The mixed empirical results provided in the current literature are an important motivational fact on this research. Some studies are able to show the positive impact, whereas others are unable to show a negative impact. Some other empirical studies demonstrate the negative relationship between leverage and cost effectiveness [1], [4], [12], [14]. Alternatively, some others may find a positive relationship, for example, Berger and di Patti [15] by using the data of American companies; and Margaritis and Psillaki [16], by applying data of French companies. Both these studies found a positive effect on debt and other research produced the same results [13], [17].

Taking Schumpeter's analysis, finance is a key element in the innovation process [18]. However, innovative companies cannot have constant access to the economic support they need. In terms of capital structure, there are some factors that are related to the adoption of information and communication technologies (ICTs). In this vein, the seminal work of Titman and Wessels [19] found that there is a link between capital structure and investment that implies less indebtedness. Mina et al. [20] revealed that emerging businesses that use technology are likely to have more access and a preference to use capital instead of financial support through debt. As an example of this, we can mention the research conducted by Chen et al. [21] who studied the relationship between investment in R&D and capital structure of Taiwanese small- and medium-sized companies. The research found that when small- and medium-sized companies engage in R&D activities, companies tend to have lower levels of debt. In another study conducted by Neville and Lucey [22] in Ireland, we can emphasize the importance of internal sources as the main source of financing with a direct positive and negative relationship. Similarly, other studies found a positive relationship between capital structure and innovation processes [11], [23].

Regarding innovation, this variable has been considered to be a critical determinant strategy to achieve business performance; therefore, it should be considered by all kinds of decision makers to place greater

importance on products, processes and management systems innovation strategies, which will allow them to achieve competitive advantages and better performance [24]. Innovation has a positive impact on corporate performance when valued from a general perspective [24], [25]. For this reason, the following hypotheses are postulated:

H₁: Capital structure has positive and significant effects on innovation.

H₂: Capital structure has positive and significant effects on firm performance.

H₃: Innovation has a positive and significant effect on firm performance.

Finally, in order to contribute to the theoretical discussion, the mediating effect represented by innovation is proposed: *H₄: Innovation mediates the relationship between capital structure and firm performance.*

3. Methodology

An empirical research was conducted with a causal, non-experimental, cross-sectional design and a quantitative approach using the Partial Least Squares Structural Equation Modeling (PLS-SEM), based on Smart PLS®3 statistical software [26]. The measurement model was estimated to fit it and demonstrate the reliability and validity of the scales. Next, the structural model was assessed as a hierarchical component model [27], using the indicator repetition approach [28], [29]. The National Economic Units' Statistical Directory [30] was taken as a reference for developing this study, considering a sample of 220 SMEs from the manufacturing sector with 11 to 250 employees in the state of Aguascalientes, Mexico, with a confidence level of 95% and a margin of error of 5%, P=Q=0.5. The survey was applied from April to July 2018 by using the simple random sampling technique and answered by the managers or owners of these firms. Regarding the measurement of the variables, a brief description of them is presented in Table 1.

Table 1. Measurement of variables

Variable	Dimensions	Indicators	Likert-type scale	Source
Capital structure (HOC)	Internal sources of financing (LOC1)	3 indicators	1=low importance	Cuevas-Vargas et al. [28]
	External sources of financing (LOC2)	9 indicators	5=high importance	
Innovation (HOC)	Product innovation (LOC3)	4 indicators	1= totally disagree	Oslo Manual OECD/Eurostat [31]
	Process innovation (LOC4)	5 indicators	5= totally agree	
	Marketing innovation (LOC5)	9 indicators		
	Organizational innovation (LOC6)	9 indicators		
Firm performance (LOC7)	N/A	Economic	1= totally disagree	Tanriverdi [32]
		Market share	5= totally agree	Chen and Huang [33]
		Productivity		Van Hemert et al. [34]

To evaluate the reliability and validity of the scales, the measurement model was estimated using the PLS-SEM. Based on the results presented in Table 2, the high internal consistency of all reflective constructs of the measurement model stands out. This is because the composite reliability (CR) exceeded the critical value of 0.708 suggested by Hair et al. [35]. In the same way, the constructs exceeded the critical value of the average variance extracted (AVE) of 0.5 [36]. Moreover, all the factor loadings were statistically significant ($p<0.001$), and the variance inflation factor (VIF) values are uniformly below the threshold value of 5.0 [35] as can be seen in Table 3, we conclude, therefore, that collinearity does not reach critical levels and is not an issue for estimating of the PLS-SEM path model. These psychometric tests guarantee converging reliability and validity of the first and second-order scales. In terms of the evidence of discriminant validity, two tests were applied in order to guarantee that each latent variable measure what in fact should be measured. First, the Heterotrait-Monotrait ratio criterion

(HTMT$_{85}$) [37], whose values of the correlations among the reflective constructs were found to be below 0.85 [37], [38]. Regarding the Fornell-Larcker criterion, the square root of the AVE of each one of the constructs, demonstrated to be greater than their correlations relative to any other construct [36]. Based on these criteria, it can be concluded that the data are reliable and acceptable to test the hypotheses using PLS-SEM.

Table 2. Reliability and validity of the constructs

LOCs	CR	AVE	LOC1	LOC2	LOC3	LOC4	LOC5	LOC6	LOC7
LOC1	0.902	0.754	**0.868**	0.435	0.191	0.260	0.417	0.360	0.266
LOC2	0.828	0.617	0.342	**0.785**	0.251	0.214	0.279	0.243	0.308
LOC3	0.922	0.748	0.160	0.214	**0.865**	0.758	0.634	0.686	0.521
LOC4	0.941	0.761	0.227	0.179	0.685	**0.872**	0.622	0.788	0.578
LOC5	0.917	0.647	0.354	0.232	0.570	0.569	**0.804**	0.668	0.577
LOC6	0.935	0.643	0.312	0.195	0.625	0.720	0.612	**0.802**	0.522
LOC7	0.933	0.822	0.230	0.195	0.464	0.526	0.520	0.476	**0.907**
HOCs		CR		AVE		Capital structure		Innovation	
Capital structure		0.837		0.515		**0.717**		0.429	
Innovation		0.958		0.501		0.355		**0.708**	

NOTE: The diagonal numbers (in bold) represent the square root of the AVE values. Above the diagonal the HTMT$_{.85}$ correlations ratio test is presented; below the diagonal, the Fornell-Larcker criterion test is shown.

4. Results and discussion

First, the results of the descriptive analysis of the manifest variables are shown in Table 3, where the median and the interquartile range (IR) are exposed. As can be seen, in the column corresponding to the median, there are seven variables with a value of four, which means that according to the perceptions of the managers or owners of such firms, these activities are important and are frequently conducted in the firms. Regarding the column corresponding to the IR as a measure of dispersion, eleven attributes have the value of 1.0, this means that there was much concordance and consensus among the respondents for these attributes. Therefore, it was found that manufacturing SMEs in Mexico used as the main source of internal financing the reinvestment of profits, which are impacting innovation and firm performance. However, these firms are developing significant improvements to their existing products and making design modifications, besides they are introducing new training practices for their human resources. Moreover, these activities are impacting the results of their profitability.

Table 3. Descriptive analysis of the data and factor loadings.

LOCs	Indicators (manifest variables)	Loading	VIF	Median	IR
Internal sources of financing (LOC1)	Reinvestment of profits	0.806***	1.614	4.0	1.0
	Contributions of the firm members	0.889***	2.327	3.0	2.0
	Incorporation of new partners	0.907***	2.578	3.0	2.0
External sources of financing (LOC2)	Supplier credits	0.823***	1.329	3.0	1.75
	Commercial banks	0.729***	1.357	3.0	2.0
	Credit cards	0.800***	1.355	3.0	2.0
Product innovation (LOC3)	Significant development of product or services	0.816***	2.050	3.0	1.0
	Development of new uses for products	0.895***	2.816	3.0	2.0
	Significant improvements to existing products	0.860***	2.608	4.0	1.0
	Product design modifications	0.886***	2.885	4.0	1.0
Process innovation (LOC4)	Introduction of new equipment to automate processes	0.809***	2.041	3.0	1.0
	Use of computer programs and techniques for the supply chain	0.887***	3.149	3.0	2.0

	New significant improved service creation and delivery methods	0.868***	2.716	3.0	2.0
	Changes to equipment and software to provide services	0.905***	3.848	3.0	2.0
	New improved equipment or software in auxiliary activities	0.889***	3.510	3.0	1.0
Marketing innovation (LOC5)	Development or adoption of new marketing methods	0.836***	2.317	3.0	1.0
	Introduction of significant changes in products design	0.779***	2.025	3.0	2.0
	Modifications to packaging to improve product appearance	0.784***	1.978	3.0	2.0
	Use of new concepts and means to promote goods or services	0.825***	2.782	3.0	2.0
	Launch of a new brand image of existing products	0.821***	2.485	3.0	2.0
	Use of new pricing methods	0.778***	2.216	3.0	2.0
Organizational innovation (LOC6)	Introduction of new methods of organizing and managing work	0.836***	3.062	3.0	1.0
	Introduction of new practices to distribute knowledge	0.822***	3.269	3.0	2.0
	Introduction of new training practices for personnel	0.868***	3.621	4.0	1.0
	Introduction of new systems for supply chain operations	0.798***	2.837	3.0	2.0
	New forms of relationship with other firms or public institutions	0.770***	3.021	3.0	2.0
	New forms of collaboration with research organizations	0.742***	3.167	3.0	2.0
	New forms of collaboration with suppliers	0.779***	2.342	3.5	2.0
	Incorporation of contracting activities	0.790***	2.730	3.0	2.0
Firm performance (LOC7)	Market share increase	0.892***	2.752	4.0	1.0
	Profitability increase	0.951***	3.676	4.0	1.0
	Productivity increase	0.876***	2.495	4.0	1.0

NOTE: Significance level: *** = p < 0.001; ** = p < 0.01; * = p < 0.05; NS= Non-significant.

To test the research hypotheses, the structural model was evaluated using bootstrapping through Smart PLS®3 [26]. The results indicated that there is evidence to obtain the confidence intervals required to evaluate the accuracy of the parameters. The structural model has predictive relevance due to that innovation and firm performance, both endogenous constructs have an explanatory capacity because the R^2 values are close to and above 0.20 [35], respectively, so that, the model has quality and its results are useful in business decision-making. Alternatively, the predictive relevance of the endogenous constructs was evaluated through the blindfolding technique of the Stone-Geisser Q^2 test, having obtained Q^2 values greater than zero [39], see Table 4.

Table 4. Results of the structural model with PLS-SEM

Hypotheses	Path	β	*t-value*	*p-value*	f^2	Decision
H1	Capital structure → Innovation	0.355	5.456	0.000	0.144	Supported
H2	Capital structure → Firm performance	0.073	1.160	0.246	0.007	Not Supported
H3	Innovation → Firm performance	0.556	9.703	0.000	0.410	Supported
H4	Capital structure → Innovation → Firm performance	0.197	4.324	0.000	N/A	Supported

f^2 effect sizes: >0.02= small effect; >0.15 = medium effect; >0.35 = large effect [40]
Innovation Q^2 *value* = 0.062; Firm performance Q^2 *value* = 0.274; Innovation R^2 *value* = 0.126; Firm performance R^2 *value* = 0.343
NOTE: Total effects of capital structure on firm performance (β = 0.270, *p-value* = 0.000)

Concerning the first hypothesis H1, the results obtained and are presented in previous Table 4 (β=0.355, p<0.001) indicate that the capital structure has positive and significant effects on innovation. Therefore, H1 is supported because the capital structure has impacted of 35.5% on innovation, and according to Cohen [40] test, it has practically a medium effect, indicating that the capital structure has a medium contribution to the prediction power of innovation. Regarding H2, the results indicate that the capital structure has a positive but non-significant effect on firm performance (β = 0.073, NS). Therefore, H2 is not supported because capital structure has a non-

significant impact of 7.3% on firm performance, and according to Cohen [40], it has not a direct contribution to the predictive power of manufacturing SMEs firm performance. As for H_3, the results evidence that innovation has a positive and significant impact on firm performance ($\beta = 0.556$, $p < 0.001$). Therefore, H_3 is supported because innovation has a significant impact of 55.6% on firm performance, and according to Cohen [40], innovation has a large contribution in the predictive power of firm performance. Finally, to demonstrate the total effects of capital structure on firm performance, indirect effects were assessed, to know the possible mediating role of innovation in the relationship between capital structure and firm performance. The results indicate a positive and significant indirect effect ($\beta=0.197$, $p<0.001$), which shows the mediating role of innovation and, based on the criteria of Zhao et al. [41], it is a full mediation considered as indirect-only effect since just the indirect effect is significant and positive, getting a total positive and significant effect of capital structure on firm performance ($\beta=0.270$, $p<0.001$). Therefore, H_4 is supported.

Additionally, the IPMA was evaluated to identify the performance of these latent variables. The findings indicate that manufacturing SMEs in Mexico that composed the sample of this study have a low performance of capital structure (53.66), but for a one unit that this exogenous variable increases its performance, it will contribute in 0.303 to increase the current firm performance (68.76), likewise, it will contribute significantly to improve the current innovation performance (56.34) by 0.379. Moreover, if the level of innovation improves in one unit, it will increase the performance of firm performance by 0.585. Alternatively, it is important to highlight that the internal sources of financing are the dimension that demonstrated to explain the capital structure of Mexican SMEs and, to a lesser extent, external sources of financing through their supplier credits.

The results confirmed that capital structure, innovation and firm performance are positively correlated. For the first assumption, the influence of capital structure on innovation was demonstrated theoretically and empirically, being like the similar results of Li et al. [23] and Zhang et al. [11]. Likewise, for the capital structure and firm performance relationship, only positive but non-significant results were obtained, but when evaluating total effects of capital structure on firm performance the results show positive and significant effects, confirming previous studies [13], [17]. Similarly, positive, and significant results were confirmed for the effects of innovation on firm performance, similar to those obtained by Cuevas-Vargas et al. [24], Gok and Peker [25].

The main contribution of this work is to establish the full mediating effect that innovation exerts in the existing relationship between capital structure and firm performance, according to the results, significant and positive results were obtained. Our study contributes to the discussion about the benefits of having an effectuation approach [42] to materialize ideas from innovativeness. Therefore, in qualitative terms, the possible mediating role of innovation in the relationship between the capital structure and the performance of the company can be explained by using the capital structure for the financing and implementation of management models of the innovation. The choice between the different sources of internal and external financing may depend on the type of innovation (incremental, radical or transformational) appropriate for the organization's market, strategy or business model. Those that depend on mature markets must develop competitive advantages to differentiate their products or services, while businesses based on emerging markets privilege continuous improvement, innovation in the value chain and optimization of processes.

5. Conclusions

In accordance with the objectives of this research, it can be concluded that capital structure is critical for corporate innovation and performance. In the short and medium terms, the development of new processes or products derived from investment in innovation may have an effect on the level of an organization's competitiveness, business growth or expansion into existing markets. In many cases, prioritizing investment in innovation is a matter of organizational survival. The highly volatile economic sectors in terms of technological changes or customer demand have driven the strategic change in their business models. For others, investing in innovation provides the means to secure a competitive advantage and/or the promise of new revenue and increased business value.

There are various significant implications for companies, academia and policy-makers that help to incorporate new perspectives of innovation. First, industry benefits from adopting resources and capabilities that help them spread its costs among the activities that most require growth. Second, the literature is strengthened by discussing theoretically and empirically the relationships that favour corporate innovation and performance. One way to encourage innovation is the implementation of awards and contests to boost employee creativity, since in emerging economies, only a few SMEs actually do so. Universities should also collaborate with small- and medium-sized companies to establish the culture and importance of registering patents and trademarks, as well as the link with other intangible assets. Third, policymakers must ensure that there is an adequate supply fund manager so that small- and medium-sized companies can access and follow-up on innovation projects. Moreover, public policies should consider the development of platforms for the exchange of knowledge of the financing they offer and the information most relevant for the owners of small- and medium-sized manufacturing companies, in order to increase mutual cooperation and avoid information asymmetry a greater extent.

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