

## THE INNOVATION PERSPECTIVE ON THE M&amp;AS: A CASE STUDY ON THE KNOWLEDGE TRANSFER SYNERGIES

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**Summary:** *Economic entities get involved in mergers and acquisitions (M&As) because they are interested in external growth strategies which can lead to an increase in the wealth of the shareholders of the participating entities. In M&As, from an acquirer or a target's perspective, a company brings its resources, which can be material or immaterial (knowledge). In the post-M&A phase, through the integration process the shareholders expect synergy gains, or that the combined firms to report efficiency gains higher than if they would activate separately. In nowadays, in a boundaryless economy, one of the most appreciated resources is knowledge. In this respect, the intangible assets, in general, and patents, in particular, are the accounting representation of knowledge in a company. They are also considered to be predictors for the deal value paid to the target company. To those we add the size of the target company, its core activity and the accounting practice, the latter being a significant mediator variable for the proposed models.*

**Keywords:** innovation, theories of the firm, M&As, innovation, performance.

**JEL Classification:** F63, G34, O34

## Introduction

Innovation is the baseline for many M&As, because it can be the source for knowledge transfer synergies. The knowledge can belong either to the acquirer or the target and it is transferred from one company to the other, it can also be shared with the other company or, eventually, taught after the integration process is over (Gupta and Roos, 2001). One element of importance related to innovation are patents and there are a lot of companies which prefer to involve in M&As, to purchase innovation, instead of producing it. The key elements in this decision are time, costs and the ease of success. According to the resource-based theory of the firm and the knowledge-based view, differences in innovative performance between firms are a result of dissimilar knowledge sources (Cloudt *et al.*, 2006).

We start by analyzing the main theories of the firm, considering the two main tools used by the companies to act like intermediaries: the market and the capital. Starting from the neoclassical theory of the firm, we get to a more contemporary approach, resource-based and knowledge-based view of the companies. Analyzing a company through its knowledge imposes a presentation of its intellectual capital and attitude towards innovation.

## 1. Resource-based vs. knowledge-based organization

Before of all, in analyzing a company, any economist or researcher starts by defining: What is a firm? Which are the characteristics that are essential in identifying a company, the ones tied to its legal status or to its economic activities? This question is quite important if, for example, one wishes to understand a company's motives to involve in restructuring activities, like M&As (Hart, 2011, Mardiros, 2013a). Over the course of time, a few brave authors brought some shade of light over the presented enigma, but they were conceptualized from different perspectives. And, this way, the theories of the firm were born.

In Spulber's (2009) opinion, firms exist only when they record an improvement in the efficiency of economic transactions. The efficiency of firms is compared to the alternative of direct exchange between consumers, which would be time consuming, and would necessitate barter, mediation and contracts. So, as a solution to this matter, the concept of companies was created, which act like

intermediaries. In this respect, economic entities have two instruments which are the fundament of economic theories: market, on a side, and capital, on the other side.

Firm theories are models of business enterprises which can predict the nature of the company, its behavior, structure or relations with the market and its partners, including the necessary explanations. Throughout history voices from the economic world stated quite a few theories related to the concept of firm, which will be presented in evolution. Every theory of the firm is an abstraction of the real-world business enterprise which is designed to address a set of its characteristics and behaviors.

Neoclassical theory of the firm establishes an equilibrium between purchase decisions on the input markets and supply decision on the output markets (Grant, 1996). For example, in his prominent microeconomics textbook, Varian (1992) defined firms as “combinations of inputs and outputs that are technologically feasible” and assumes that a firm develops its core activities to maximize the profits. The traditional organization theory analyzes the internal structure of the firm and the relationships between its constituent units and departments and it is based on the view of an organization as an information-processing machine that takes and processes information, which circulates between different levels of the organization (Nonaka and Toyama, 2015).

Dissatisfaction with Knight's explanation of the firm in terms of optimal risk allocation in the face of individuals' differential risk preferences (Knight, 1921) encouraged the emergence of the transaction cost theory of the firm which focused upon the relative efficiency of authority-based organization ('hierarchies') with contract-based organization ('markets') (Coase, 1937; Williamson, 1975). Attempts at integrating economics and organizational approaches to the theory of the firm have included the behavioral theory of the firm (Cyert and March, 1963) and the evolutionary theory of the firm (Nelson and Winter, 1982).

According to Grant (1996), the resource-based view (RBV) of the firm is less a theory of firm structure and behavior as an attempt to explain and predict why some firms succeed in establishing positions of sustainable competitive advantage and, in so doing, earn superior returns. In brief, the RBV attempts to explain firm sustainable competitive advantage as stemming from firm resources that are rare, valuable, hard or impossible to imitate or duplicate, and hard to substitute (Bromiley and Rau, 2016).

The RBV argues that firms achieve competitive advantages through the application of valuable resources at their disposal. Resources can be separated into those that are tangible and property based, and those that are intangible and knowledge-based (Hörisch *et al.*, 2014, Wiklund and Shepherd, 2003, Mardiros, 2013b). The emerging 'knowledge-based view' is not, as yet, a theory of the firm. There is insufficient consensus as to its precepts or purpose, let alone its analysis and predictions, for it to be recognized as a 'theory'. To the extent that it focuses upon knowledge as the most strategically important of the firm's resources, it is an outgrowth of the resource-based view.

## **2. M&As in innovative industries: characteristics and assimilated synergies**

The M&A literature shows that one of the most frequently cited reason for such operations is to achieve synergy. Invoking the concept of synergy in the pre-merger and acquisition phase is not a new practice. However, the forecasts for fixing a certain type of synergy at this stage (the forecasts) may not lead to the desired effect. It is worth mentioning in this regard that some synergies take time to manifest, at least three years after the completion of specific operations.

From a theoretical point of view, synergies can be analyzed from a double perspective: as incentives for entities to engage in business combinations or as a result. As far as synergy types are to be of concern. It should be noted that where one can speak about a positive synergy effect, i.e. an increase in wealth, the probability to obtain the reverse phenomenon it must not be neglected. Thus, it is materialized in a negative synergy effect. We are tempted to believe, at least at first glance, that in the post-restructuring period of economic entities we can see both forms of synergy effect within the final entity, but overall, the impact of the combination should be positive.

Sirower (1997) is of the opinion that in justifying a company's option to engage in M&As: the premium paid to the target company's shareholders must be related with the synergy expected to be achieved in a competitive field. In fact, the premium is the first manifestation of the expected synergy

if we were to start from the assumption that the manager concludes the transaction considering that the added value to be obtained exceeds that amount paid in addition to the shareholders of the target company. Given this, we consider that the best way to represent the premium is to report the deal value paid to the shareholders to the shareholders' funds of the target company.

Innovations are fundamental tools for organizational transformation that lead to successful business results. Thus, their assessment should focus on planning, execution and investment management in this respect. Consequently, a company should ensure that investment in innovation matches the strategic objectives of the company/post-merger companies; be innovative, by constantly reviewing company's/companies' capabilities to respond to industry change; and integrate post-concentration IT&C resources to achieve synergy (Chen, 2012). These issues must be correlated with the resource-based approach, which argues that the competitive advantages of a company are indissolubly linked to its valuable, rare and irreplaceable resources. Patents and any assets resulting from innovations may support this theory if such a company is involved in transactions such as M&As.

Technological innovations generate synergies that vary in the speed of occurrence and the magnitude of their impact. A classification that takes into account the impact of innovation determines two types of synergies: *additive synergies* and *multiplicative synergies* (Harrigan *et al.*, 2016).

If a business merger collectively uses its innovative resources to expense for research and development, reflected later in patents, then it creates *multiplicative synergies*, which contribute to enhancing technological skills instead of combining them. Thus, synthesizing ideas from different sources to create something radically different leads to synergies, thus contributing to the organizational learning process associated with such inventions that lead to the development of vast technological skills.

As far as *additive synergies* are concerned, they are built incrementally on existing technologies. An example would be software programs that are modified to meet post-merger/acquisition needs. The advantage of these synergies is that they are faster in post-merger/acquisition and they improve the results of repetitive activities, streamlining phases and working processes. The disadvantage is the fact that they are limited, and their profitability decreases over time.

### 3. Hypotheses development

Cho and La (2014) compare the premium with the expected synergy to be obtained from M&As, taking into account the influence of time as a factor: premiums are paid immediately, while synergies take time to manifest, they are expected to occur after at least one year from the transaction date. Most authors believe that they occur even after three years from that date (Weber and Dholakia, 2000, Loukianova *et al.*, 2017). In this context, they delimit the following situations:

- a.  $\text{synergy} \geq \text{premium}$  - this combination results from the accumulation of up-to-date positive synergies that are equal to or exceed the amount of the premium paid to the target entity's shareholders. In this case, we have the situation of a successful M&A;
- b.  $0 \leq \text{synergy} \leq \text{premium}$  - in this case, the present value of future synergies is positive, but does not exceed the amount of premium paid to the shareholders of the target company. In the literature, this situation corresponds to a merger or acquisition that is not successful (Zhu and Zhu, 2016);
- c.  $\text{synergy} \leq 0$ . The literature shows that, when two economic entities decide to merge, the sum of the whole, over time, becomes larger than the mere sum of its component parts (Anthony, 2017, Mei *et al.*, 2015, Burgin and Meissner, 2017). Studies show that when it comes to synergy, it can be positive or negative. If the synergy is negative, it cumulates, in fact, to the premium and represents together the total loss in the process. This is considered the case when the M&A is a failure.

In fact, the size of the premium payable to the target company's shareholders may, in some cases, exceed the value of the stock market capitalization of the target company and is not correlated with the expected synergies for several reasons: insufficient understanding of the concept of synergy, presentation of the expected synergy without being identified specifically the sources for obtaining it without specific calculations or a presentation of the steps to be taken to achieve it.

Qian (2000) states that successful foreign direct investment for a company depends on firm's possession of intangible assets, but that is not sufficient, being sensitive to the ownership advantages provided by target countries in the local environment.

To date, little, or only weak, empirical support exists for assessing the influence of intangibles on the price paid by an acquirer for a target company. Considering the opinion of Harvey and Lusch (1997), there are a number of situations which necessitate the valuation of intangible assets for legal as well as accounting transactions: (1) an exchange in which intangibles are transferred between companies; (2) in an allocation of purchase price during acquisition when all the assets of a business, both tangible and intangible, are valued; (3) in support of the determination of royalty rates or license fees; (4) to estimate a loss due to abandonment or casualty; (5) in support of enterprise valuation, when the company is involved in a business concentration, like M&As; and (6) for their use as collateral in financing. Thus, they can influence, positively or negatively, the M&A and, indirectly, the deal value paid by the acquirer.

*H<sub>1</sub>*: The value of the intangible assets and the size of the target company have a negative effect on the deal value paid in M&As, while the core activity of the acquired company has a positive effect on the same value, reported to the shareholders' funds.

*H<sub>2</sub>*: The accounting practice of the target has a positive effect on the deal value paid in concertation, reported to the value of the shareholders' funds of the acquired company.

These hypotheses will be tested and validated using the statistical software SPSS 25.0.

## 5. Research methodology and design

To test and to validate the proposed research hypotheses, the study analyses the empirical data related to 164 M&As, for the 2011 – 2017 period of time, considering the target companies that are involved in M&A because they declared patents, as a motive for concentration. To reach the proposed research hypotheses, we use linear regression and crosstabulation.

### 5.1. Target population and analyzed sample

To confirm the research hypotheses, the data regarding M&As were gathered from two databases, for the 2011-2017 period of time. The information regarding the deals representing M&As was collected from the Zephyr database (target name, target country, acquirer name, acquirer country, deal type, deal value, the motive – patents, primary NACE Rev.2 code for the target); financial information was collected from Orbis database (shareholders' funds, intangibles, total assets for the target company). The M&As considered to be innovation-based are marked with patents.

### 5.2. Models proposed for analysis and data source

This paper examines a series of factors influencing the deal value in M&As which involved target companies owning patents. The deal value was pondered with shareholders' funds. Because the target companies are the ones that own the patents, the financial information are referring to them and include data related to assets, intangibles, the size of the company and NACE main section.

The proposed variables are presented in Table 1.

**Table 1. The variables proposed for the analysis**

Symbol	Representation	Description	Explanation
Deal value/ shareholders' funds (DV)	%	Dependent variable	The ratio of deal value in the shareholders' funds of the target company. Information collected from Zephyr database (deal value) and Orbis database (equity), for the 2010-2017 period of time.
R&D/Fixed assets (RD)	%	Independent variable/ numeric	The ratio of R&D expenses in the value of long-term assets; information collected from Orbis database, for the 2010-2017 period of time.
Intangibles/Total assets (IA)	%	Independent variable/ numeric	The ratio of intangible assets in the value of total assets; information

Symbol	Representation	Description	Explanation
<b>Size of the company (SC)</b>	1. Small company 2. Medium-size company 3. Large company 4. Very large company	Independent variable/ categorical	collected from Orbis database, for the 2010-2017 period of time. The size of the target company; information collected from Zephyr database, for the 2010-2017 period of time.
<b>NACE main section (NACE)</b>	1. Industry 2. Services	Independent variable/ categorical	According to EU, sections A-G from NACE Rev. 2 are associated to industry, sections H-U are composing the services. The data regarding the NACE main section for the target company are collected from Zephyr database, for the 2010-2017 period of time.
<b>Accounting practice (AccP)</b>	1. IFRS 2. Local GAAP	Mediation variable/ categorical	The accounting practice of the target company; information collected from Orbis database, for the 2010-2017 period of time.

Source: Authors' own processing

*Dependent variable.* This variable represents the ratio between deal value paid in the M&A and the shareholders' funds, for the year before the concentration. Thus, this ratio reflects the excess amount paid over the value of the equity of the target company. If the variable is over 1, the acquirer paid more than the net worth of the target company.

*Independent variables.* These variables are presented in Table 1 and they are calculated for the target company, considering the financial information for the year before the M&A. According to Rozen-Backer (2018), the data from the year before the concentration are specific to pre-M&A stage and they are collected from Orbis database.

*Mediation variable.* The assumption of causality is implicit in the definition of mediation, as a mediator is defined as an explanatory mechanism through which one variable affects another (Wood *et al.*, 2007). This variable is considered for the year of the merger, given the fact that there are studies which validated its significance in influencing a financial dependent variable (Aevoae *et al.*, 2018; Robu *et al.*, 2017).

The proposed hypotheses are examined using mediation analysis. There are multiple ways to test a mediation model (Frazier *et al.*, 2004, Wu and Zumbo, 2008). When paths a and b are controlled, a previously significant relation between IV and DV is no longer significant (complete mediation) or its significance is dropping (partial mediation). In our case, the paths are presented in Fig. 1:

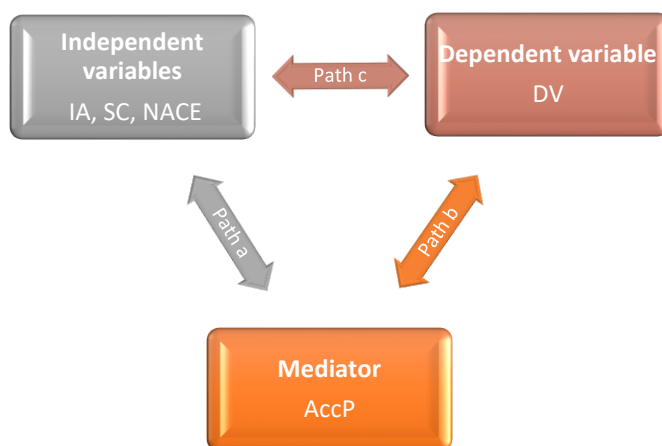


Fig. 1. The proposed mediation model

Source: Authors' own processing

Our mediation model includes the following steps:

1) path *c* is predicting the dependent variable *DV* from independent variables *IA*, *SC* and *NACE* (without the mediator); the model is presented in Eq. (1):

$$DV (\%) = \alpha + \beta_1 \cdot IA + \beta_2 \cdot SC + \beta_3 \cdot NACE + \varepsilon \quad (1)$$

2) path *a* is predicting the mediator *AccP* from the independent variables *IA*, *SC* and *NACE*; the model is presented in Eq. (2):

$$AccP = \alpha + \beta_1 \cdot IA + \beta_2 \cdot SC + \beta_3 \cdot NACE + \varepsilon \quad (2)$$

3) path *b x c* is predicting the dependent variable *DV* from independent variables *IA*, *SC* and *NACE* (including the mediator); the model is presented in Eq. (3):

$$DV (\%) = \alpha + \beta_1 \cdot IA + \beta_2 \cdot SC + \beta_3 \cdot NACE + \beta_4 \cdot AccP + \varepsilon \quad (3)$$

The used method is *hierarchical linear regression* (HLR) because it is a way to show if variables of our interest explain a statistically significant amount of variance in our DV after accounting for all other variables. Also, our study includes *variance inflation factor* (VIF), to identify multicollinearity problems. The VIF and tolerance are both widely used measures of the degree of multi-collinearity of the *i*<sup>th</sup> independent variable with the other independent variables in a regression model (O'Brien, 2007) and its normal threshold is 10.

## 6. Research results

The study will present a series of descriptive statistics for the analyzed variables (per total and on categories considered in the analysis), of the values of the Pearson correlation coefficients and the estimations of the parameters of the proposed regression models.

### 6.1. Descriptive statistics

Table 2 shows the descriptive of our sample of M&As.

**Table 2. The descriptive statistics for the chosen sample of M&As**

Variables	Categories	N	Mean	St. Dev.	Median	95% Confidence interval	
						Lower	Upper
NACE	Industry	110	2.860618	9.063363	1.922710	1.147886	4.573351
	Services	54	13.008817	31.769972	2.808645	4.337284	21.680350
Year	2011	1	-	-	-	-	-
	2012	1	-	-	-	-	-
	2013	13	2.840092	14.460311	2.336466	-5.898186	11.578370
	2014	18	5.532233	13.315306	1.129262	-1.089313	12.153779
	2015	37	4.140290	17.852485	1.958028	-1.812025	10.092605
	2016	58	5.336873	17.087992	1.354132	0.843815	9.829931
	2017	36	10.737168	29.730512	3.644815	0.677810	20.796526
AccP	IFRS	110	5.147202	18.992685	1.487524	1.558094	8.736310
	Local	54	8.350962	22.355592	4.284978	2.249060	14.452863
	GAAP						
SC	Small	4	32.998885	61.348493	3.306210	-64.620257	130.61803
	Medium	2	46.957282	57.107131	46.957282	-466.12993	560.044501
	Large	33	5.109697	14.422491	1.887392	560.044501	10.223690
	Very large	125	4.980912	17.631984	2.011642	1.859483	8.102341
<b>Total</b>		<b>164</b>	<b>6.202098</b>	<b>20.149504</b>	<b>2.023261</b>	<b>3.095200</b>	<b>9.308996</b>

Source: Authors' own processing using SPSS 25.0

For our sample of M&As, the target companies report patents, according to Zephyr database, and we consider only the transactions that involve one acquirer and one target company (164 M&As, 164 acquirers and 164 targets). Out of the 164 targets, 67.07% are activating in industry and 32.93% in services, considering that sections A-G from NACE Rev. 2 are associated to industry, while sections H-U are composing the services (European Commission, 2008). According to Table 2, the proportion is the same for accounting practices (IFRS vs. local GAAP), while the vast proportion of the entities involved in M&As as targets are very large entities (76.22%). In the same time, we acknowledge the fact that, for medium and large entities, the acquirers paid up to 560 times the value of shareholders' funds purchased in M&A.

**6.2. Results on the influence of the macroeconomic and microeconomic determinants of the percentage acquired in the target company**

The correlations between the numeric variables included in the models are presented in Table 3.

**Table 3. The correlations between the variables included in the models**

Variables	DV	NACE	SC	IA	AccP
DV (%)	1.000	.237	-.221	.026	.075
	.	.001***	.002***	.372	.170
NACE	.237	1.000	-.081	.223	-.104
	.001***	.	.150	.002***	.092
SC	-.221	-.081	1.000	-.069	-.271
	.002***	.150	.	.188	.000***
IA	.026	.223	-.069	1.000	-.093
	.372	.002***	.188	.	.117
AccP	.075	-.104	-.271	-.093	1.000
	.170	.092	.000***	.117	.

Source: Authors' own processing using SPSS 25.0

The correlations reveal unexpected patterns. In M&As which involved patents, there isn't a significant correlation between the deal value paid for the target shares and the value of intangibles reported by the target companies (sig. = 0.372, r = 0.026). Also, there isn't a correlation between deal value and the accounting practices (sig. = 0.170, r = 0.075). On the other side, the size of the target company and its core activity are significantly correlated with the dependent variable, but there are differences: the deal value is negatively correlated with the size (sig. = 0.002, r = -0.221), but positively correlated with core activity (sig. = 0.001, r = 0.237). This implies that a large company won't determine a high deal value, while the second reveals the fact that, for industrial companies, the deal value is way higher than the shareholders' funds in the purchased target company.

Table 4 and 5 display the estimations of the parameters of the three regression models proposed for testing and validation.

**Table 4. Parameters estimation for the regression model for path a)**

Variables	$\beta$	t-values
Intangibles/Total assets (IA)	-0.040	-0.515
Size of the company (SC)	-0.205***	-2.717
NACE main section (NACE)	0.230***	2.975
$R^2$		0.099
Adjusted $R^2$		0.082
F		F(3,160) = 5.842, p = 0.001
Multicollinearity tests	***p < 0.01	
	Tolerance $\tau_i = 1 - R_i^2 = 1 - 0.099 = 0.901$	
	VIF = $\frac{1}{\tau_i} = \frac{1}{0.901} = 1.110$	

Source: Authors' own processing using SPSS 25.0

For the model presented Table 4, the chosen predictors are microeconomic data, related to the target company (the ratio of intangibles in total assets, size of the company and target's core activity). The model should predict how much of the variance of the dependent variable is justified by the target country's information. The regression model is significant (F (3, 160) = 5.842; p < 0.001) but explains a small percentage of the variance in the dependent variable ( $R^2 = .099$ ). The predictors, size of the company (sig. = 0.002) and NACE (sig. = 0.003), account for 9.9% of the variance of the dependent variable (the ratio between deal value and shareholders' funds).

**Table 5. Parameters estimation for the HLR model for paths c) and b) x c)**

Variables	Values for path c)		Values for path b) x c)	
	$\beta$	t-values	$\beta$	t-values
<i>Intangibles/Total assets (IA)</i>	-0.089	-1.394	-0.036	-0.461
<i>Size of the company (SC)</i>	-0.286***	-3.785	-0.192**	-2.438
<i>NACE main section (NACE)</i>	-0.108	-1.156	0.234***	3.012
<i>Accounting practice</i>	-	-	0.044	0.556
$R^2$	0.097		0.100	
<i>Adjusted R<sup>2</sup></i>	0.080		0.078	
<i>R<sup>2</sup> change</i>	-		0.003	
<i>F</i>	F(3,160) = 5.723, p = 0.001		F(4,159) = 4.440, p = 0.002	
<i>Multicollinearity tests</i>	***p < 0.01		**p < 0.05; ***p < 0.01	
	Tolerance	$\tau_i = 1 - R_i^2 = 1 - 0.097 = 0.903$	Tolerance	$\tau_i = 1 - R_i^2 = 1 - 0.100 = 0.90$
	VIF = $\frac{1}{\tau_i} = \frac{1}{0.903} = 1.107$		VIF = $\frac{1}{\tau_i} = \frac{1}{0.90} = 1.111$	

Source: Authors' own processing using SPSS 25.0

Although our models presented in Table 5 don't have very high values of  $R^2$ , the last model explains better the variance of the dependent variable than the previous one in the HLR. Moreover, the difference of  $R^2$  between our presented models is statistically significant. Thus, we can say that the added variable in the last model (mediator variable) improves the prediction of the DV. We can say that the added variable explains an additional 0.3% from the variance of our DV (deal value/shareholders' funds). Even though the increase has a low value and kipping in mind the theoretical aspects of the HLR, it still has a positive effect in our  $R^2$ .

## Conclusions

The analysis of the determinants of the deal value paid in a M&A transaction is of a great importance, given the fact that the difference between this deal value and the net worth of the purchased company is, in Sirower's opinion, the first manifestation of synergy. The premium paid in such a transaction can be based on different motives but, in the case of innovation-based M&As, the acquirer is searching for specific treats of the target company, which fall under the resource-based view, more specifically under knowledge-based view. For this reason, we reported the deal value to the correspondent part of the shareholders' funds of the target company, thus creating a ratio which was considered as dependent variable for our models.

Given the distinct nature of the knowledge and the distinctive way of being assessed, we chose the intangible fixed assets of the acquired company as a first determinant of the deal value. However, by testing this assumption on a sample of 164 M&As which had as main feature, the patents owned by the target companies, we conclude that the intangibles are not significant in predicting the deal value paid. On the other side, the size of the target and its core activity are significantly influencing the price paid for the acquired company. In this model, the accounting practice (IFRS and local GAAP) was considered a mediator variable, because it led to a  $R^2$  which could predict more from the variance of the dependent variable.

One of the limits of the study is represented by the fact that, although the M&As were selected based on the fact they involved patents, no information was available on their number and value, so they could be considered an independent variable.

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