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EXECUTIVE SUMMARY OF THE THESIS

The impact of target CEO retention on the innovation productivity of the target employees

TESI MAGISTRALE IN MANAGEMENT ENGINEERING – INGEGNERIA GESTIONALE

AUTHORS: CARLO TARANTOLA & COSTANZA TRAVERSI

ADVISOR: Massimo Gaetano Colombo (Politecnico di Milano)

CO-ADVISOR: Keivan Aghasi (University of Cambridge)

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1. Introduction

High-tech industries are characterized by the speed of technological innovation becoming a new standard. Companies operating in these sectors must therefore rely on acquisitions as key enablers to unlock new capabilities and knowledge. However, mergers and acquisitions are delicate and can lead to unforeseeable results: structural/organizational changes, cultural differences, and changes in operations can undermine inventors' habits and disrupt their innovativeness. **Our research aims to establish the link between the retention of the target CEO and changes in post-acquisition inventors' productivity, investigating characteristics that can mitigate or amplify this effect**. To analyse the change in inventors' productivity, we relied on patent indicators. In fact, unlike other innovation performance indicators, being patents linked to a specific person, they allow to have a higher flexibility on the granularity of the research.
This work contributes to the evolution of studies on post-acquisition performances, focusing on variables that affect the inventors' productivity in the aftermath of acquisitions. In doing so, we used a database constituted by **243** technological acquisitions occurred between 2001 and 2015, in the USA high-tech sector.

2. Theoretical background

Over time, M&A activities have witnessed several waves, becoming a solid component of business strategies for many companies. It has been observed that the primary driver for subscribing the transaction is the desire to obtain new resources (e.g., [2]), with the achievement of valuable competitive advantage. In particular, the high-tech sector results to be the one with the highest growth rate in M&A activities due to the speed of innovativeness. It follows that internal R&D is not sufficient for commercializing and developing always new ideas and, thus, it needs to be supported by an additional source. From this situation it derives the approach to technology-driven acquisitions: transactions undertaken for the willingness of obtaining the new capabilities of target firms. In line with the Knowledge-Based View (KBV), the object of these

transactions lies in the knowledge which enhances the firm's performances [6]. Target inventors are defined as one of the most sought-after strategic resources since they can improve the stock of knowledge and create new employment of existing knowledge. As consequence, the success of the acquisition depends on the ability to properly use these capabilities that are difficult to transfer because of their dependency on mechanisms built among target employees. It derives that the implementation is the crucial phase, in fact it determines the high failure rate of high-tech acquisitions (e.g., [5]), and it engenders organizational disruption, which reduces inventors' performance [2]. This is why managing target employees and maintaining their productivity in the post-acquisition period is challenging for acquiring firms. In our study, we analysed the performance of each single inventor post-acquisition, adopting patents as an objective measure to evaluate innovation performances. In doing so, we complemented simple patent counting with quality indicators, overcoming the limits of quantitative patents as an index of innovation.

Acquisition literature largely agrees that post-acquisition performance depends on the implementation phase [5], which involves the possibility of **retaining/replacing the target CEO**. This decision is worth to be analysed since keeping the target CEOs creates a favourable condition for inventors to stay in the post-acquisition period, avoiding the possibility to jeopardize the success of the entire transaction [1].

2.1 CEO Retention

In line with the Resource-Based View (RBV), high-tech acquisitions partially allow to obtain a competitive advantage by retaining successful target human resources, namely CEOs. The target CEO is in the best position to monitor the implementation process and deploy strategic decisions. In small high-tech firms the role of the CEO is even more prominent since these companies do not have a dedicated management team, hence most operations and strategic decisions pass through the CEO that needs to initiate/agree.

Moreover, she contributes to the implementation success by adopting **mobilizing and mitigating actions [4]**. Mobilizing are those actions through which target CEOs facilitate coordination among the acquiring and the target firm, while mitigating actions are needed to diminish inventors' discomfort. Furthermore, Aghasi et al. (2017) [1], demonstrate that CEO retention is a necessary condition to grant autonomy to target firms, essential for letting inventors explore on-going developments. To resume: without retaining the CEO, the acquirer loses a facilitator in the integration process, and the probability of a cultural shock for inventors will increase. Considering what is stated above, we can derive the first hypothesis:

H1: Target CEO retention has a positive effect on the productivity of target inventors in the post-acquisition period.

2.2 CEO's characteristics

What past research has failed to address is how different **CEOs' characteristics** influence the effect of their retention on inventors' productivity.

However, not all CEOs are alike: characteristics and status matter a lot in determining the output of the implementation phase. Therefore, the replacement decision should come after a deep assessment of the CEO's human capital, her knowledge, and specific capabilities. In the following section we will analyse three of these characteristics.

FOUNDER CEO

Past literature suggests that founder-CEOs play a central role in shaping the company's culture and long-term view and tend to be perceived by employees as more charismatic leader in comparison to non-founder-CEOs [3]. Our hypothesis is that by exploiting a **firm-specific knowledge** and a **charismatic presence**, founder CEOs can perform more effective mobilizing and mitigating actions. This in turn, will reassure and guide inventors by reducing disruptive effects of mergers that compromise inventors' work within the company. We formulate our second hypothesis:

H2: If the target CEO was a founder of the target company, her retention has a stronger positive impact on the productivity of target inventors in the post-acquisition period.

CEO TENURE

Another interesting distinguishing is the **target CEOs tenure**, defined as the number of years at the time of the acquisition, for which the CEO has had executive powers. Longer-tenured CEOs are those that accumulated more experience within the firm, and thus, in the implementation phase, the coordination between acquiring and target firm is better off.

In conclusion, our hypothesis is that thanks to a deeper **firm-specific knowledge** and **experience gathered**, longer-tenured CEOs are able to perform more effective mobilizing and mitigating actions. We set the third hypothesis:

H3: The longer the CEO played an executive role in the target company, the stronger the positive impact of her retention on the productivity of target inventors in the post-acquisition period.

CEO DUALITY

A third characteristic worth analysing is whether the CEO has different roles within the target company. In particular, we are interested in isolating the effect that a CEO, who is also the Chairman, has on post-acquisition productivity. Without a board imposing controlling actions, a dual CEO acquires unique power allowing her to make strategic decisions and to lead the company outside shareholders' interest (**management entrenchment**). Dual-target CEOs can impose suboptimal post-acquisition-strategic decisions (i.e., retention, integration) leveraging high bargaining power. Moreover, in a delicate period such as the implementation phase, entrenched and power-seeking CEOs will **neglect inventors' serenity in favour of personal ambition** and thus alimenting disorientation and confusion among acquired resources. Our last hypothesis follows:

H4: If the target CEO was the Chairman of the target company, her retention has a negative impact on the productivity of target inventors in the post-acquisition period.

3. Methodology

We analysed a sample of acquisitions that took place in the U.S. high-tech industry, in a reference period of 15 years (2001-2015). The work was performed mainly on the 2006-2015 sample and then integrated with data belonging to 2001-2005. All these transactions are characterized by large and listed buyers, while target companies are small and medium-sized enterprises (less than 500 employees) which are mostly privately held. The core of the work lies in the process of collecting, cleaning, and integrating databases, containing data related to two periods (i.e., 2001-2005 and 2006-2015) and different views (i.e., Patent Level, Inventor Level, and Firm Level). Firm to Patent, the level of observation changes and the degree of granularity and completeness, provided by patent databases, increases. Specific criteria were followed for data collection: the sample is restricted to American Companies operating in high technology industries. Only successful patent applications, in a time window of -5/+5 years with respect to the acquisition were considered. Moreover, the statistical analysis is based on "stay" inventors, those that left the company after the completion year of the acquisition and hence, their indicators have not null values; then the focus remains on "active" inventors within the target company, whose performance can be detected through patent analysis.

3.1 Context Variables-LexisNexis

With the purpose of obtaining data regarding a set of acquisitions, the "Merged Thompson-Zephyr" database was the starting point. It reports information (i.e., economic and general data) about acquiring and target firms involved in **319** acquisitions, which took place in the U.S. market between 2006 and 2015, in the high-tech sector. Lexis Nexis was used to gather information about the context of acquisition to ensure these transactions had **technological motivations in nature** and **target companies were independent entities** at the time of acquisitions. Besides, Lexis Nexis's news allowed to identify CEOs of target companies at the time of acquisition. At the end of this step, **228** CEOs related to so many acquisitions were identified.

3.2 CEO's Variables

To capture the impact of CEO retention on the innovation productivity, it was necessary to collect data related to the target CEOs' life and her career path. LinkedIn was employed as primary source of data, while Bloomberg, Zoom Info and

others, as secondary. Ultimately, considering each transaction, it was executed the integration of CEOs' information at inventor level.

3.3 Inventors' name harmonization

Each inventor should be recognized by a unique identifier, however, the identification process generated not negligible challenges in the academic literature due to the lack of standardization in identifying inventors who have the same name/last name or those who have identical names but are different people.

3.3.1 Patent Level & Inventor Level

At patent level, data related to inventors (inventor id, name, last name) were already disambiguated through the Patentsview Algorithm; however, we proceeded manually in correcting possible wrong inventors' data, which otherwise would negatively affect the statistical analysis.
Firstly, duplicates, or faulty inventors were retrieved and harmonized according to data related to the "correct" inventor. Secondly, adjustments were reported at the inventor level. Thirdly, at this level, key indicators related to the patenting activity of each inventor were corrected coherently with the harmonization process. Fourthly, with the purpose of keeping track of inventors' past careers, LinkedIn URLs were attached to the database to easily analyse the professional history of inventors (leveraging on "Png LinkedIn Patent Inventor FIVE Data" file).

3.4 Merging process

To define the complete sample of data related to 2001-2015, it was necessary to implement a merge between the databases of different years, by standardizing columns' names and adding missed variables. The result was Patent Level, Inventor level, and Firm-Level. We obtained: **243** acquisitions at the firm level; **4151** inventor id at inventor level; **4074** target CEOs at inventor level (of whom **1128** retained); **18071** patent id at patent level.

3.5 Variables

3.5.1 Dependent variables

To study the innovative level of target inventors after the acquisition considering the impact of CEO retention/replacement, we choose dependent variables able to measure changes in productivity and variations in patent quality. In doing so, we aimed to determine data about patents produced (quantity) and capture the technological and economic value of innovations (quality), since the pre-acquisition phase. Three dependent variables were selected: Change Inventor Productivity (number of patents generated by the inventor in +5/-5 years with respect to acquisition), Change Inventor patent breadth (the difference between the average breadth of patents generated by the inventor in +5/-5 year respect to acquisition), Change Inventor Patent Quality Index 4 (composite indicator based on four basic patent qualities: forward citation, size of the patent family, number of claims, backward citations).

3.5.2 Independent Variables

The CEO retention was used as the independent variable to evaluate its impact on the post-acquisition innovative performance of target inventors. We examined the binary variable (i.e., "ind_ret"), which is equal to 1 if the CEO of the target firm remains in the company in a one-year window after the acquisition, 0 otherwise.

3.5.3 Moderators

We were interested in the moderating effect generated by CEOs' characteristics on the relation between CEO retention and inventors' performance post-acquisition. Therefore, we analysed Founder Status, CEO Tenure, and CEO Duality as moderators.

3.5.4 Control Variables

Our model's specification includes several control variables. The first set of controls considers CEOs' characteristics (Gender and Moderator variables). Second, the inventor level was considered to analyse changes in inventors' performance after the transaction (Inventor Tenure, Male, Nr of Patents, Inventor Breadth of the patent, Quality Index 4). Third, we considered the characteristics of the target firm (VC Backed, Age, Size, Listed, Relative Size, Technology Relatedness, Acquirer Experience).

3.6 Models

We developed twelve models according to the several combinations of dependent and independent variables. To assess the effect of the

independent variable, we used the Tobit model in case of Change in Inventor Productivity (given the discrete nature), while the OLS model was employed to deal with the other two dependent variables.

4. Results

Our dissertation demonstrates that ex-post decision-making can highly influence the success of an acquisition, to the extent of determining its failure. **All results are entirely consistent with the announced hypothesis.**

First, we found that CEO retention has positive impact on post-acquisition innovative performance of inventors [Table 1]. For all the models, coefficients are positive and significant with a p-value lower than 1%: as the CEO is retained by the acquiring firm, there is a higher probability that the innovative level of target inventors raises after the transaction.

VARIABLES	Model I	Model II	Model III
CEO Retention	2.070***	4.620***	0.508***
	(0.594)	(0.966)	(0.114)

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 1 - Results of Hypothesis 1 (considering control variables)

Second, with all control variables significant, the moderation effect of founder-CEO, as expected, strengthens the positive relation between CEO retention and the dependent variables, with a significance level which decreases just in model VI (p < 10%) [Table 2].

VARIABLES	Model IV	Model V	Model VI
Founder# CEO Retention	2.578**	4.142**	0.453*
	(0.109)	(0.237)	(0.0311)

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 2 - Results of Hypothesis 4 (control variables included)

Third, the moderating effect generated by the CEO tenure enhances the impact of CEO retention on the productivity of target inventors. However, the interaction variable is negative and not significant in model VII, while moving toward the other models, the relation becomes positive, and the significance increases (p<1% and p<5%, in model VIII and model IX) [Table 3].

VARIABLES	Model VII	Model VIII	Model IX
Tenure CEO# CEO Retention	-0.0640	0.448**	0.0447*
	(0.116)	(0.186)	(0.0240)

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3 - Results of Hypothesis 2 (control variables included)

Finally, in line with extant literature, CEO duality leads to have overpowered CEOs and principal-agent problems, which negatively moderate the relation between the CEO retention and the innovative performance of inventors after the acquisition. This is confirmed by a negative relationship which keeps its significance at p<1%, in each model [Table 4].

VARIABLES	Model X	Model XI	Model XII
CEO Duality# CEO Retention	-7.245***	-9.681***	-2.479***
	(1.420)	(2.065)	(0.351)

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 4 - Results of Hypothesis 3 (control variables included)

5. Conclusions & Managerial Implications

We contribute to the literature regarding the **evaluation of possible effects generated by CEO retention** (e.g., [4]), by **directly linking the performance of single inventors to CEO retention**. First, a new methodology to measure acquisition success is offered, which allows defining value creation and potential synergies in highly specialized domains. Then, our findings also corroborate the importance of the target CEOs' role in the post-acquisition performance of inventors. Going beyond this relation, we investigate **how different types of retained target CEOs impact inventors' performances**. What we achieved demonstrates that maintaining the CEO

allows to lessen effects caused by technology-driven acquisitions: uncertainty spread among target employees, hierarchical disruption, and variations in control structures.
For managerial implications, acquirers should try to bring up knowledge-sharing routines which support the transmission of information and ease inter-organization interactions. Therefore, in high-tech acquisitions retaining the target CEO is the winning strategy: she works as a "soft coordinator" [4], facilitating the transaction and enhancing the level of innovation of individual inventors. Moreover, we yield interesting insights about the CEO status and her characteristics to boost the acquired inventors' performances. The acquiring firm should be even more confident in engaging the target CEO when she results to be also the founder, thanks to her social presence within the target firm. In addition, the tenure of the target CEO allows enhancing her mobilizing and mitigating actions, alleviating the acquiring firm during the implementation phase, and supporting inventors. On the contrary, when dealing with a target dual CEO, acquiring firms should perform a deeper analysis before deciding whether to retain her or not. In the post-acquisition period dual- CEOs could exploit their bargaining power in imposing sub-optimal decisions for the company. Target CEOs are overpowered, leading them to overlook inventors' psychological stability and prefer their personal interests, failing to pursue mobilizing and mitigating actions.

6. Bibliography

References

[1] Aghasi, K., Colombo, M. G., & Rossi-Lamastra, C. (2017). Acquisitions of small high-tech firms as a mechanism for external knowledge sourcing: The integration-autonomy dilemma. Technological Forecasting and Social Change, 120, 334-346.

[2] Chaudhuri, S., & Tabrizi, B. (1999). Capturing the real value in high-tech acquisitions. Harvard business review, 77, 123-132.

[3] Dobrev, S. D., & Barnett, W. P. (2005). Organizational roles and transition to entrepreneurship. Academy of Management Journal, 48(3), 433-449.

[4] Graebner, M. E. (2004). Momentum and serendipity: How acquired leaders create value in the integration of technology firms. Strategic management journal, 25(8-9), 751-777.

[5] Graebner, M. E., Eisenhardt, K. M., & Roundy, P. T. (2010). Success and failure in technology acquisitions: Lessons for buyers and sellers. Academy of management perspectives, 24(3), 73-92.

[6] Grant, R. M. (2002). The knowledge-based view of the firm. The strategic management of intellectual capital and organizational knowledge, 17(2), 133-148.

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The impact of target CEO retention on the innovation productivity of the target employees

TESI DI LAUREA MAGISTRALE IN MANAGEMENT ENGINEERING

Authors: **Carlo Tarantola, Costanza Traversi**

Student ID:	945188, 941422
Advisor:	Prof. Massimo Gaetano Colombo (Politecnico di Milano)
Co-advisor:	Dr. Keivan Aghasi (University of Cambridge)
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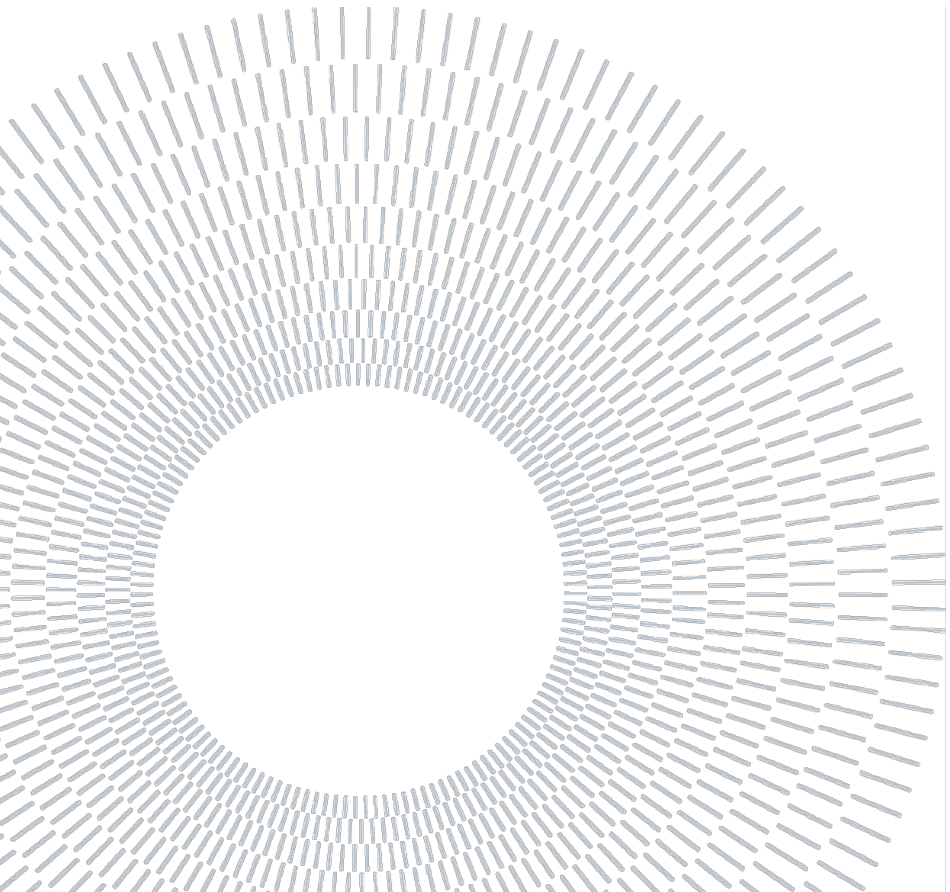

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Abstract

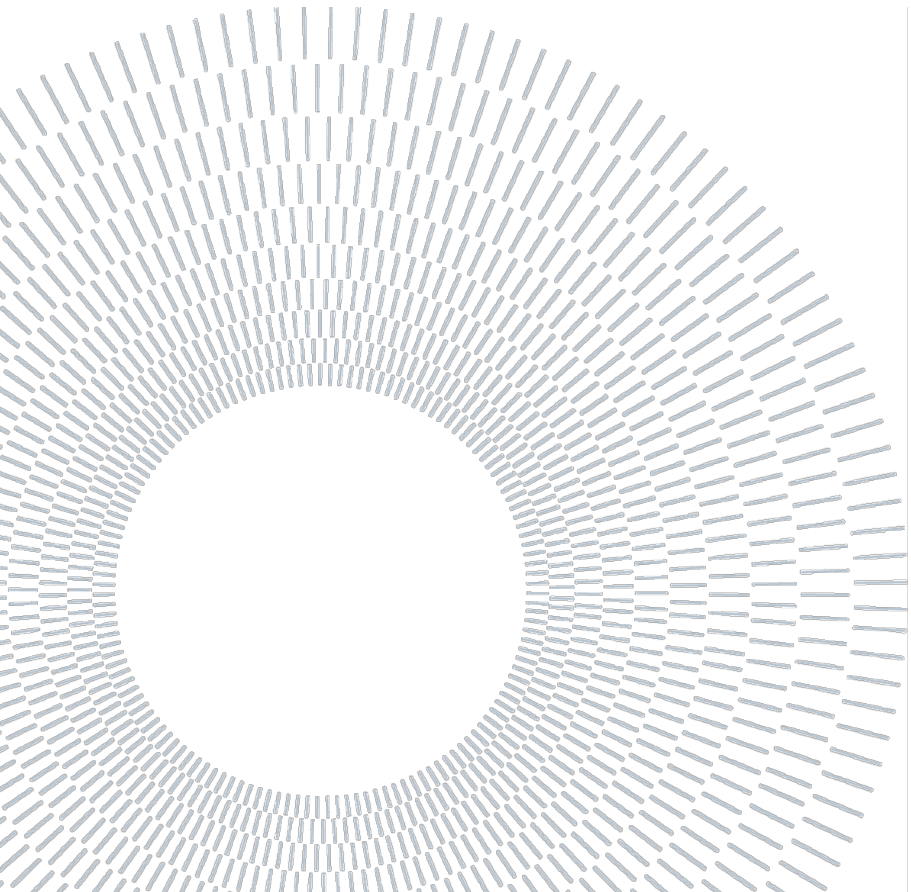
High-tech industries are characterized by the speed of technological innovation becoming a new standard. Well-established companies operating in these industries are progressively relying on merger and acquisitions (M&As) as key enabler to unlocking new technical capabilities. For acquiring firms, target human capitals (i.e., inventors) represent the attractive factors leading toward the transaction, since they are the most significant source of tacit knowledge and innovative performance. Despite these potential values, M&As are delicate activities which may lead to a severe organizational disruption that generates sense of disorder in target inventors and disrupts their productivity (caused by structural and management changes). Preserving the target inventors' productivity is possible only by adopting an adequate implementation strategy which ensures their integration within the new organization. This research aims to capture the change in post-acquisition productivity of target inventors affected by the decision of target CEO retention/replacement. Going beyond, we analysed how different CEOs´ characteristics (i.e., founder-CEOs, CEO tenure and CEO duality) shape their capabilities in managing the post-acquisition implementation activities, thus weakening, or strengthening the effect of their retention on inventor's productivity. In performing our analysis, we relied on a database based on 243 technological acquisitions that occurred between 2001 and 2015 in the USA high-tech sector. Results of econometrics estimates validate our hypothesis.

Key words: Technology Acquisitions, Post-Acquisition Implementation Strategies, CEO retention, Founder-CEO, CEO Duality, CEO Tenure, Innovative Performance, Inventors, Patents

Abstract in lingua italiana

Le industrie high-tech sono caratterizzate dalla velocità con cui un'innovazione si trasforma in un requisito "standard". Per questo motivo, le aziende consolidate operanti in tali settori sfruttano le attività di M&A come strumento complementare all'area interna di R&D che permette di accedere a nuove conoscenze tecniche. Per le aziende acquirenti, il capitale umano (i.e., gli inventori) dell'azienda target è il fattore attrattivo che spinge verso l'acquisizione, dal momento che rappresenta la fonte più significativa di conoscenza tacita e di potenziale innovativo. Tuttavia, le acquisizioni high-tech sono attività delicate che generano disorientamento negli inventori target e riducono la loro produttività (a causa di cambiamenti strutturali e manageriali). Preservare tale produttività è possibile solo adottando una strategia di implementazione che garantisca un'adeguata integrazione degli inventori target all'interno della nuova organizzazione. Questa ricerca intende dunque cogliere il cambio di produttività degli inventori target come conseguenza dalla decisione di mantenere o sostituire il CEO acquisito. In aggiunta a ciò, abbiamo analizzato come diverse caratteristiche del CEO definiscano le sue capacità di gestione, indebolendo o rafforzando l'effetto del suo mantenimento sul livello di produttività degli inventori.
Per eseguire la nostra analisi ci siamo basati su un database costituito da 243 acquisizioni tecnologiche avvenute tra il 2001 e il 2015 nel settore high-tech degli Stati Uniti. I risultati delle stime econometriche convalidano le nostre ipotesi.

Parole chiave: Acquisizioni Tecnologiche, Strategie di Implementazione post-acquisizione, Sostituzione del CEO, CEO Fondatore, CEO Duale, Mandato del CEO, Prestazioni Innovative, Brevetti



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1. Introduction

Over time, merger and acquisition (M&A) activities have witnessed several waves, becoming a solid component of business strategies for many companies. Nowadays, these activities allow to re-structure the organizational environment of the company, with consequences and effects on the whole related environment (e.g., employees, financial and innovative performances). Following the peak in the number of acquisitions reached in 1990, it has been observed that the primary driver for subscribing the transaction is the desire to obtain new resources (Ahuja & Katila, 2001; Chaudhuri & Tabrizi, 1999), with the achievement of competitive advantage, durable and difficult to be reproduced. In particular, M&A activities in the high-tech sector rose dramatically during 1990sh (Sikora, 2000). Companies in these industries are embedded by a common sense of competition which derives from the speed of innovativeness: the pace and magnitude of change but also breadth and depth of knowledge. This condition makes necessary an additional source for commercializing and developing new ideas, which can complement and support the internal research and development area (R&D) (Graebner, Eisenhardt & Roundy, 2010; Kogut & Zander, 1992; Ranft & Lord, 2000). For this reason, the company relies on technology-driven acquisition: transaction undertaken to obtain new capabilities from the target firms. Small high-tech firms become suitable plunders for incumbents because of their avantgarde technologies and highly specialized skills.

What makes these high–tech firms so attractive? Their human capital (i.e., inventors). The valuable source of companies operating in these industries is their human capital, namely knowledge workers (i.e., scientists and inventors), defined as one of the most sought–after strategic resources (Ranft & Lord, 2000). Inventors that work for the target firm become a potential resource for the acquiring company after the acquisition: they are able to improve the stock of knowledge and create new employment of existing knowledge. Moreover, the potential value lies in the opportunity to create a competitive advantage for the new organization: their knowledge depends on relationships and mechanisms built among employees, thus difficult to be replicated by competitors.

Despite the benefits that technology acquisition could generate to acquiring firms, the rate of failure is not negligible, as reported by many scholars (e.g., Souder & Chakrabarti, 1984; Buhner, 1990). The extant literature analysed dynamics that take place during acquisitions, showing that many of them fail and generate more obstacles than advantages; a branch of this literature reveals that the post-acquisition performance depends on the post-acquisition implementation phase (Larsson & Finkelstein, 1999; Pablo, 1994; Graebner, Heimeriks, Huy & Vaara, 2017), when the CEO choice arise and coordination among companies is needed. Not by chance, the inter-company integration phase is one of the thorniest phases, which can engender organizational disruption and reduce the inventors' performance (Kirchner, 1990; Muller-Stewens, 1991; Lazear, 1995). This is why managing target employees and maintaining their productivity in the post-acquisition period is challenging for acquiring firms. On one side, changes in the structure need to be implemented, especially for routines and management systems which allow harmonizing the newly merged organization with the acquirer's objective; on the other side, the implementation of these changes generate disruption in terms of working

environment, especially when methods are far from the acquired firm. This condition brings out disorientation and demotivation among acquired employees, with consequent negative implications on productivity.

Literature underlines that CEO retention positively affects inventors' performance in post-acquisition phases: it is a common belief that retaining executives increase performances. Krishnan and Miller (1997) found that high executive turnover was associated with lower post-acquisition performance, also caused by the scarce performance of the parent firm (mainly focused on the achievement of integration). By contrast, Cannella and Hambrick (1993) described CEO retention and the central role given to target inventors in the new organization as crucial determinants for post-acquisition performance. Aghasi, Colombo and Rossi-Lamastra (2021) deepened the topic analysing the **status of CEOs as the founder** of the target company, revealing that founder-CEOs are more likely to be retained in technology-driven acquisition with young target firms. Parallelly, academic literature took an interest in **CEO duality** (the phenomenon of an individual serving both as CEO and Chairman), one of the most discussed phenomena given its dichotomy in nature (Dalton, Hitt, Certo, & Dalton, 2007); the topic always became more complex, engendering the need of understanding the practice over time. Many scholars studied the performance implications of CEO duality, revealing opposite opinions and leaving much uncovered (e.g., Dalton, Daily, Ellstrad, & Johnson's, 1998). Besides, CEO tenure influences firm performance, whose underlying channels of influence remained largely unexplored (Luo, Kanuri &Andrews, 2014).

In conclusion, our research aims to **capture the impact of target CEO retention or replacement on the innovation productivity of the target employees in the post-acquisition period.** The analysis even considers target CEOs' characteristics, namely

founder status, CEO tenure, CEO duality, and how these factors mitigate the effect of CEO retention/replacement on the innovative performance generated by target inventors in the new organization. We analysed 243 transactions in the US high-tech industry, realized from 2001 to 2015. In doing so, we traced the patenting activity of target inventors before and after the acquisition, using several indicators to measure the innovative performance.

Consistent with this preview, the structure of our thesis is organized as reported: **chapter II** introduces an overview of the existing theoretical background, starting with general M&A activities and then switching to the high–tech acquisitions, considering recent trends and academic literature. **Chapter III** proceeds with the analysis of factors affecting the performances of target inventors and provides evidence about the effectiveness of patents as a measure of innovative performance**.** Downward the measurement of performance, in **chapter IV** we elaborate on key aspects of the implementation phase: the decision to maintain the CEO within the new organization and how the integration–autonomy dilemma affects the target CEOs autonomy and, in turn, inventors' productivity. **Chapter V** discloses the research project and presents our four hypotheses: the direct effect of CEO retention on the innovative performance and the moderating role played by founder status, CEO duality, and tenure on the relationship between CEO retention and innovative post-acquisition performances. **Chapter VI** describes the methodology followed: input data, integration process, creation of key figures and achievement of the final sample; then, the set of variables is presented together with the model's specifications. Finally, empirical results and implications can be read in **chapter VII** and **VIII.**

Part I – LITERATURE REVIEW

2. Theoretical Overview

M&As are part of the corporate strategy and, above all, modify the ownership structure of two or more companies. More in general, the terminology refers to the combination of the involved companies, previously independent and each with its own assets and governance structure, into one commonly owned firm through different types of transactions (i.e., mergers, acquisitions, consolidations, tender offers) (Bruner, 2014; Hagedoorn & Duysters, 2002). As Cartwright and Schoenberg (2006) state, M&A activity represents a complex phenomenon that encompasses financial, operational, behavioural, and strategic aspects, gaining the attention of a broad range of disciplines. Indeed, this multidisciplinary nature has made M&A activity the core of many papers that captured several perspectives and methods of research: they have brought detailed insights into a number of relevant aspects, providing a more holistic view about what impacts on its performance and what effects it brings (Cartwright & Schoenberg, 2006).

Over the 20th century, M&As have passed from being considered just as additional elements of companies' business strategy to being assumed as an essential tool for

pursuing it. Initially, they were conceived as static and well-regulated transactions, then the willingness of creating value and competing in a more globalized context has transformed them into processes where the scenario can frequently evolve, new entrants appearing continuously, and daily challenges affect the normal context. Narrowing the field of observation, the acquisition "peak", which affected the whole economy in the late 90s, has also reached the high technology industries. Companies playing in this sector strongly desire to be ahead in this rapid-evolutionary market. Therefore, always more high-tech players push themselves outside their boundaries, searching for a unique competitive advantage. In pursuing this strategy, managers often tend to focus on specific products or market share and fail to meet the expectation. In fact, this approach is not applicable **in high-tech acquisitions**, in which **technological capabilities** - tied to personal skills - **are the key success factors**. Indeed, dealing with short-term benefits results to be misleading for managers that, in turn, become more inclined in investing in target companies not useful for their object. In high-tech acquisitions, the traditional acquisition model must be inverted: people in the first place, followed by physical assets and brands (Chaudhuri & Tabrizi, 1999).

Technology-driven acquisitions can be seen as passe-partout to quickly obtain valuable technology (Ahuja & Katila, 2001), to enter in international markets reliably (Vermeulen & Barkema, 2001), and to restructure underperforming firms (Davis & Stout, 1992). All these results will be analysed more in detail in the next sections where we will target the whole field of technology M&A. In particular, this second chapter provides an overall picture of the past literature contribution. Section one and section two focus on acquisitions that involve small high-tech companies, while section three and four describe the views which support the importance of human resource for acquiring firms, namely Resource-Based View (RBV) and Knowledge-Based View (KBV).

2.1 M&A Activities in Technology Industries

Nowadays, technology acquisitions are mechanisms that allow to adopt a new source of competences which resides outside the boundaries of the firm: the acquiring company can insource technological capabilities and knowledge from the target firm. Then, the performance of the acquiring firm will be linked to its ability to integrate and transfer the target firm's knowledge base into its structure (Barney, 1986).

Technology-based industries are featured by higher growth rates than those of other sectors: comparing high tech stocks with those of other industries, the growth of the first wholly outpaced the latter (Ranft & Lord, 2002), even if the considerable volatility generated by the disorder of the "dot-com bubble" affected the market of M&A. Moving forward in time, considering last years, COVID-19 tried out the acquisition sector, but it also demonstrated how much is important the presence of technology assets.

Since 1990, M&A activity experienced a relevant growth enhanced by the willingness of well-established firms to exploit growth opportunities offered by smaller high-tech firms (Bauer & Matzler, 2014). Some recent evidence shows that in 2020 the 80% of deals aimed to obtain new capabilities belong to technology industry (Bain & Company, M&A report 2021), result never achieved in the last 20years. However, this is coming at the cost of generating higher competition, so that new acquirers are incentivized to revise the approach for acquisitions. Going through a few recent figures of M&A activity (from PricewaterhouseCoopers' Report 2021), the record level of deals continued from late 2020 to 2021.

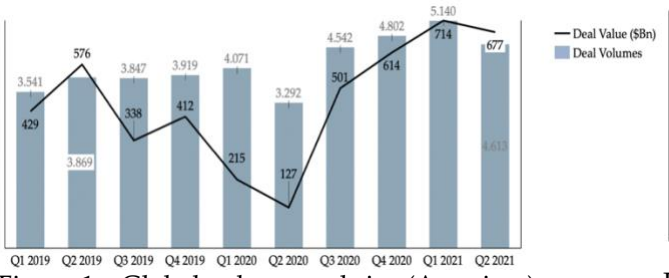


Figure 1 – Global volume and size (Americas)

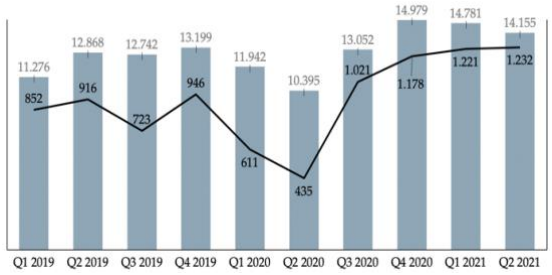


Figure 2 - Volume and size (Global)

As reported in the bar charts (Figure 1, 2), the current year has followed the positive trend of the last one, in terms of growth size of deals, reaching the peak in the first quarter of this year. This situation has contributed to achieving the global deal values of more than 1tn US$ per quarter compared the last 12 months.

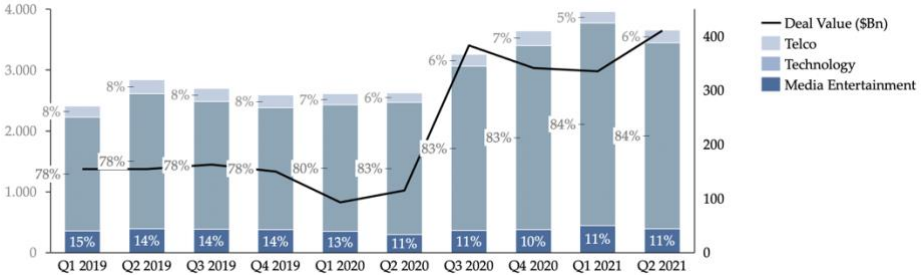


Figure 3 - Technology, Media & Entertainment and Telecommunications Deal Volumes and Values (Global)

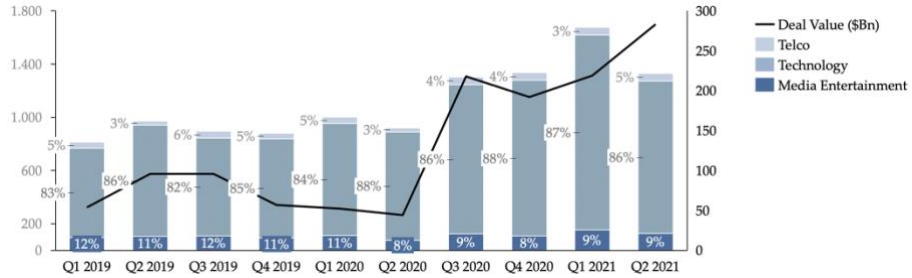


Figure 4 - Technology, Media & Entertainment and Telecommunications Deal Volumes and Values (America)

Focusing on high-tech sectors (Figure 4, 5), companies have accounted for roughly 33% of all megadeals in the first semester of 2021, and the amount becomes 50% considering all companies with a technology-based business model, regardless of their sector.

High-tech industries need to be tackled differently from other industries, especially when dealing with acquisitions in these sectors. High-tech product life cycles can last even just few months. A newly launched product can boost market shares and profits but then the rapid pace of innovation makes gains non-durable. Long-term leaders need the support of continuous investments, which allow them to avoid technology's decline and to give rise to new versions of it. However, this requires considerable efforts in time and costs, and it does not guarantee the company's ability to keep the leadership. The key success factor is **technical capability**. Motorola, for instance, developed a specific capability in signal processing which allowed it to hold the leadership for many years. Capabilities are hard to imitate. Thus, they represent a natural barrier for new entries and permit to regain the market even after years of missing leadership (Chaudhuri & Tabrizi, 1999).

In this context of fast-changing, high speed, and complex technologies, it is challenging to generate innovations with immediate succession (Brown & Eisenhardt, 1997). Therefore, acquiring companies need to focus on obtaining real capabilities. The internal R&D becomes a source of innovation that need to be complemented. If the external environment continues to evolve, being able to stay competitive on the market, keeping the same level of innovative performance and relying only on internal resources become challenging. A real-time case is the semiconductor industry (Accenture: *Recharge Semiconductor growth with M&A). T*he sector is currently experiencing a relevant change of route: the internal growth through R&D is costly by now, the speed of change is high, and the demand is wide. From this situation, the need of M&A as strategy to obtain new resources and capabilities.

In support of what was mentioned, it is relevant to resort to past literature regarding the world of high-tech acquisitions, key motives for undertaking these transactions (including buyer's and seller's points of view), and possible challenges which may occur.

To begin, scholars distinguish **technological and nontechnological** acquisitions which differently impact the post-acquisition outcome. In "*Technological acquisitions and the innovation performance of the acquiring firm: a longitudinal study*", Ahuja and Katila (2001) defines "technological" those acquisitions which provide technological inputs. Consequently, nontechnological acquisitions (with no technological inputs) do not impact the innovative output and, hence, the value creation is lower.

Just considering the technological inputs is possible to understand the effects of the transaction on the acquirer's innovative performance. Further, the authors identify the size of the acquired knowledge base and the relatedness of the involved firms as key variables which contribute to define the new level of innovation after the transaction. Following this distinction, Hitt, Hoskisson, Johnson and Moesel (1996) point out determinant factors that, according to the corporate control tradition, undermine the innovation in post-acquisitions: in case of nontechnological acquisitions, where the contribution to innovation is low or null, agency problems, reduction in managerial commitment and required energy of management teams result more relevant and difficult to manage.

Focusing on technology acquisitions, academic literature identifies **strategic technologies and key capabilities as principal rationale** behind each transaction (Ranft & Lord, 2002), since it is no longer possible to rely just on R&D to build a sustainable competitive advantage (Agbim, Zever & Oriarewo, 2014). M&A activity in

high-tech sectors is driven by the willingness to acquire new specific technologies and the technical expertise of employees (Kozin & Young, 1994).

Companies as Oracle, Cisco, and Dell are just some of the acquirers that leveraged on acquisitions to enhance existing products, to enlarge an existing business, or to get expertise in a determined service (Worthen, 2009; Sorkin, 2009b; Vance, 2009; Sorkin, 2009a). Nowadays, time and costs are so crucial and relevant that they determine the rationale behind the decision of acquiring small private firms instead of developing in-house knowledge; this results in improving the time-to-market and strengthen product development (Puranam, Singh & Zollo, 2006), reducing uncertainties coming from internal R&D (Ranft & Lord, 2002).

Graebner et al., (2010) developed a study that analyses the motives for which a company is usually more incentivized to acquire a smaller high-tech firm instead of pursuing other possibilities. Main drivers for buyers can be synthetized in three points: first, **add valuable strategic resources**. It is a common belief that these acquisitions are realized firstly to obtain specific products/technologies that are owned by the target firm (Birkinshaw, Bresman & Hakanson, 2000; Graebner, 2004; Ranft & Lord, 2000); furthermore, the choice of acquisitions is favourited by the possibility to exploit the innovative capacity of smaller firms. Secondly, the possibility to have access to the tacit knowledge and socially complex is a relevant deterrent for which the buyer follows the acquisition path: usually, the knowledge lies in individuals and how they relate to each other; this gives rise to something difficult to imitate because it depends on relationships and some mechanisms that are triggered among employees. It follows the uniqueness of the innovative capacity. It is just the complete acquisition of the target firm that gives the possibility to take control even over the human resource, as long as there is an adequate integration strategy.

Second, **enhance market power**. The possibility to achieve new regions and clients, belonging to the target firm's network, are relevant incentives to subscribe acquisitions. Moreover, this strategy is adopted even when there is the willingness to eliminate current and potential rivals: competitors are acquired and incorporated so their entire market becomes under the acquirer's control (Graebner et al., 2010).
Third, **achieve strategic renewal**. The objective is the radical change in how the performance is achieved, further improving it (Agarwal & Helfat, 2009).
Scherer (1965) specifies that small firms are more efficient at innovating with respect to incumbents, specifically for radical forms of innovations which more likely occur in the former (Zenger, 1994). Acquirers perform these transactions to overcome the lack of "entrepreneurial spirits" (Graebner et al., 2010), which, instead, features smaller companies and can be perfectly complemented by acquirers' assets. From past research, the higher innovative performance of the small firm can be reconducted to their intrinsic structure: they offer flexible and dependable work contracts, which is reflected in their appetite for creativity (Holmstrom, 1989; Milgrom & Roberts, 1988; Zenger & Lazzarini, 2004). Moreover, the risk-averse logic of large firms leads them toward incremental innovations instead of radical ones (Sørensen & Stuart, 2000). This is confirmed by Ahuja and Katila (2001) which choose minor improvements with better applicability to products instead of searching for radical innovations.

Eventually, Graeber et al. (2010) go further in analysing possible challenges that may happen during the acquisitions. Upstream the transaction, potential problems lie on uncertain conditions and asymmetrical information which affect buyer and seller: both parties could get wrong in the evaluation of the counterpart, overpaying the target resources or overlooking attractive resources. Downstream, both entities are

incentivized to keep the productive momentum going, which could be affected by multiple changes that the deal requires.

More in general, capturing the value coming from high-tech acquisitions can be challenging, and the failure easily realized (e.g., Singh & Montgomery, 1987; Datta, Narayanan & Pinches, 1992; Anand & Singh, 1997). Indeed, the application of target technologies must deal with uncertainties and complexities related to the implementation phase of the acquisition (Coff, 1999; Saxton and Dollinger, 2004). Firstly, the choice of whether retaining or not the target CEO results crucial in the acquisition process and, consequently, in determining the corporate performance. Acquisitions are disruptive events; thus, the presence of the target CEO can mitigate these effects on inventors: CEOs embed the knowledge of their firm and represent the landmark for target inventors. However, the decision of CEO retention/replacement is contextual (Krug, Wright, & Kroll, 2014) and depends on the individual and on the working environment in which she operates. The relevance of this topic can even be perceived from the huge number of studies which investigate CEOs departure, their ability in creating value and the turnover rate following acquisitions (Buchholtz, Ribbens, & Houle, 2003; Krug, Wright, & Kroll, 2014; Graebner, 2004). The topic will be deepened in section 4.1.

Furthermore, the definition of the structural form after the transaction represents a demanding task of the acquisition process since it can enhance or limit the effect of CEO retention (i.e., autonomy): section 4.2 is dedicated to the crucial trade-off between integration and autonomy, which strongly affect the innovative performance of the newly created entity. Briefly, acquiring firm must weigh the control over the target firm against organizational costs to be sustained to deal with disruption and demotivation (Datta, 1991; Datta & Grant, 1990; Larsson & Finkelstein, 1999; Ranft & Lord, 2002).

In synthesis, **technology M&A are tools to pursue technological innovations and keep the competitive advantage**. Even the most recent data confirm the relevant usage of high-tech M&A as a strategy to gain external knowledge, otherwise difficult to be replicated. Literature deeply focused on drivers and potential challenges related to these activities, underlining why small firms are the target, which results in more fertile for the creation of technological knowledge and the subsequent development of innovative processes.

2.2 Small Firms' M&A: source of technological and knowledge-based capabilities

Now, let's turn our attention to the seller, who has received less attention from researchers but plays a significant role in technology acquisitions.

It has been proved that technological acquisitions give the possibility to first achieve the most valuable resources of the target firms, those difficult to imitate and replicate, and then even exploit technological assets and products. As we mentioned before, smaller high-tech firms are so attractive because it is easier to obtain their know-how (Dosi, 1988), and they are faster to be integrated. Small firms are a relevant source of innovation during the early stages of new emerging technologies (Abernathy & Utterback, 1978; Utterback & Suarez, 1993) and represent a powerful means through which it is possible to boost national rates of technological innovation and international competitiveness (Rothwell, 1984; Pavitt, 1990; Oakey, 1991; Jones-Evans & Westhead, 1996).

Sellers have higher power in the period before the acquisition and become less significant after the transaction, that is why they must pay attention to correctly define the clauses of the deal to protect their interests (Graebner et al., 2010). Evidence shows that the willingness to gain access to strategic resources drives seller's acquisition decision and its preference for specific buyers: Graebner and Eisenhardt (2004) demonstrate that sellers prefer buyers who offer similar and complementary resources, that are key aspects for creating value by merging the two firms. A further motive for sellers is related to personal reasons: reduce personal stress and achieve financial liquidity. At the same time, sellers aim at maximizing employees' welfare by seeking for acquirors in line with the culture of the company, preventing their

employees from layoffs, relocation and downgrade of responsibilities (Dalziel, 2008; Graebner, 2009; Graebner & Eisenhardt, 2004).

Nowadays, being able to continuously keep up with technical and technological know-how is a strategic requirement that cannot be lacking if the goal is to act in an increasingly competitive market (Christensen & Overdorf, 2000). At the same time, this implies to have always new difficulties that existing companies must face when an industry's technology foundation changes (Christensen & Bower, 1996). What happens is that the new model radically changes the problem and the approach to it (Dosi, 1988). This explains why companies need to learn how to leverage a different source of technology methods, depending on the complexity of change. This means being able to both employ internal R&D and external sources of innovations, such as R&D agreements, joint ventures, and acquisitions (Hagedoorn & Schakenraad, 1994). Internal development is usually preferred for firms whose technologies are close to their existing expertise **(**Capron & Mitchell, 2009**)**: R&D requires less time and post-deal integration activities, which also means lower uncertainty level associated with a new emerging scheme, and it adds technical efficiency by developing the prior knowledge to exploit the technological spill-over coming from the external context (Cohen & Levinthal, 1990). Nevertheless, internal R&D presents huge limits in letting companies sustain the technological development coming from outside. When the new paradigm emerges, the existing technological expertise of the firm is not enough: the know-how needed cannot be found within the field of knowledge of the company. From this need, the necessity of seeking outside the existing locus of skills of the firm: M&A's targets are chosen because of their complementary resources and knowledge bases, with the object to supplement the internal R&D unit.

The complete transfer of know-how can take place if coupled with proper **integration of the knowledge, which is expected to be tacit, complex, and created on multiple relations among individuals** (Kogut & Zander, 1992; Ranft & Lord, 2002), and hence achievable just through acquisition.

2.3 Resource-Based View of Target Firms

In a world affected by globalization, technological development and diffusion of new technologies, companies need to seek new sources of competitive advantage and engage in new forms of competition. High-tech M&As are critical means by which technology firms obtain the resources needed to compete in global markets. Among these resources, the target human capital matters a lot, at the point of compromising the success of the high-tech acquisition. This idea leveraged on the Resource-Based View (RBV), a theory which emphasizes the role of internal resources: **choosing the resource is a fundamental mechanism for value creation** and the way through which internal resources combine each other generate processes which lead to obtain the competitive advantage; it considers companies as a "container" of tangible and intangible assets (Penrose, 1959; Wernerfelt, 1984) which, in turn, permit to be different from competitors. Companies can compete and stay on the market just if they have superior resources, protected by isolating mechanisms which hamper the diffusion. According to Barney (1991), resources must be valuable, rare, inimitable, and non-replicable (VRIN) to be useful for the company differentiation. Indeed, a strategic value is owned by intangible resources (IR), since by nature, they cannot be transferred and are difficult to be imitated. **The knowledge of human resources has a key role within IR, since it is peculiar to each company and fundamental for value creation** (Teece, Pisano & Shuen, 1997). The RBV considers high-tech acquisitions as ways to improve the competitive advantage, because of the possibility to obtain new technical

skills and capabilities; further, target CEOs are seen as critical resources since, in case of retention, they will be embedded in the acquiring firm.

Target CEOs stand at the top of executive managers and thus, they synthetize all the general and firm-specific investments which can generate a long-term advantage (Barney, 1991; Shleiferand & Summers, 1988**;** Castanias & Helfat, 1991). Indeed, several are the extant papers related to human capital view which reveal a positive relation between the retention of target CEOs/management and the firm's performance (e.g., Bargeron, Schilngemann, Stulz & Zutter, 2009; Cannella & Hambrick, 1993).

In conclusion, the RBV supports the idea that internal resources drive toward the achievement of a competitive advantage and argues that high-tech acquisitions partially allow to obtain a competitive advantage by retaining successful target human resources, namely CEOs. **Keep the target CEOs creates a favourable condition for employees to stay in the post-acquisition period, avoiding the possibility to jeopardize the success of the entire transaction** (Hussinger, 2010; Kapor & Lim, 2007). The topic will be deepened in chapter IV, where the retention/replacement decision will be deeply discussed, and a clearer picture will be defined.

2.4 Knowledge-Based View of Target Firms

As already mentioned, the main object of high-tech acquisitions lies in knowledge and capabilities, which enhance firm advantage and performances. From this idea, theorists gave rise to the Knowledge-Based View (KBV) (Berman, Down & Hill, 2002): a stream of ideas born in 1990s, which led to consider the knowledge as factor of production. From that period on, a huge number of publications have produced guidelines for knowledge management and its effects on the increment of business effectiveness, while other contributions have posed questions about how firm's boundaries depend on the firm's knowledge. According to Grant (2002), external changes such as post-industrial economy, digitalization, interconnectivity, and network, have not been the motives for the relevant surge of interest in knowledge, rather it has been the evolution of the intellectual activity that has led to perceive the knowledge as a key resource within the firm; indeed, the most powerful tool of knowledge management is related to the tacit knowledge.

Past literature talks a lot about knowledge-based resources which result key to the success of the acquisition. Managing these resources is as fragile as valuable and the characteristic that makes acquisition worthwhile is how much critical can be gaining such knowledge from other firms. In *An Evolutionary Theory of Economic Change (1982)*, Nelson and Winter (1982) conceive the business firm as an "organization that knows how to do things" (Winter, 1987) and, according to the KBV, companies are warehouses of knowledge useful to create value, an engine for the evolution of the high-tech sector. Thus, the potentiality of the firm lies in the effective and efficient usage of this knowledge.

A crucial point related to the KBV and the world of high-tech acquisitions is the integration phase: **since most valuable forms of knowledge depend on path-**

dependent processes (Dosi, 1982; Nelson & Winter, 1982), **knowledge workers depend on and get used to these specific processes** (Swart & Kinnie 2003). It follows that the implementation of the high-tech acquisition is the "crucial source" for the competitive advantage (Grant, 2002). Once that the target firm has been identified and acquired, it is a key issue understanding how the knowledge owned by human capital could be integrated in the proper way. The acquisition is not just the stand-alone transaction, it also involves an implementation phase which regards both the transfer and integration of the target within the acquiror, which, in the end, will own internal and external knowledge (Raft & Lord, 2000). This is the reason why each acquirer should pay particular attention to the integration topic, in order to facilitate the matching of specific competencies, that positively affect the efficiency, but which require a higher organizational effort, leading to the integration and coordination problem (Raft & Lord, 2000; Grant, 2002).

2.4.1 The most important resource: Inventors' Knowledge

To introduce a technological innovation what matters is not just the existence of the project but also people able to carry out the project itself.

One of the assumptions at the basis of the KBV (Grant, 2002) states that "**the knowledge is created by individuals**", it lies upon an individual and collective human capital that must specialize in order to generate and store it (Simon, 1991). Acquisitions as means for obtaining technology resources (Hitt, Hoskisson, & Ireland, 1990, 1991) involve knowledge workers which could react differently to transactions that affect their environment and social context. For knowledge workers, the environment and the company where they interact are decisive (Ranft & Lord, 2000), hence the solely acquisition cannot let the tacit and socially complex knowledge survive.

Many studies have been conducted on the effects of acquisitions on the level of technological innovations, generally finding a declining rate; most common motivations are directed towards strategic reasons (the choice of external growth instead of the organic development). However, Paruchuri, Nerkar and Hambrik (2006) shift their attention on the human factor: a higher level of productivity loss is recorded in acquisitions which are directly disruptive for technical personnel that lose their status and centricity in the new organization.

This study contributes to the KBV literature to the extent that acquiring productive employees does not ensure continuous productivity: the knowledge depends on a **complex and path-dependent context, and it can be completely jeopardized if the context is disrupted** (Ranft & Lord 2000, 2002). As the authors say, "scientists are the key for successful transfer of technological capabilities", hence the integration, amplifier for synergic benefits, is decisive. Take into account feeling of target employees in post-acquisition phase should have the priority for business leaders (Schweiger, Ivancevich, & Power, 1987). In fact, acquire knowledge workers is not enough to get their capabilities: structure, systems and strategies are key elements to develop to achieve a successful high-tech acquisition (DeNisi, Hitt, & Jackson, 2003).

Previous studies demonstrated that the knowledge-building capabilities depend on inventors' behaviours (Allen & Cohen, 1969; Nerkar & Paruchuri, 2005; Tushman, 1977) and evidence demonstrate that actually acquisitions negatively impact on these types of workers: inventors leave, and this reduces the benefits derived from M&A **(**Ernst & Vitt, 2000; Paruchuri et al., 2006; Ranft & Lord, 2002). Due to the **disruptive effects of mergers, psychological reactions are inducted in inventors, compromising their work within the company** (Fugate, Kinicki, & Prussia, 2008): in order to address disruptive events, inventors' attention is devoted to understanding what is going on

and which resources use to face the situation (Folkman & Lazarus, 1985; Fugate et al., 2008; Staw, Sandelands & Dutton, 1981).

Streams of literature focused on firm-level actions and their different impacts on inventors reveal that the knowledge of focal inventors becomes more relevant to complement the R&D activity of the firm in post-merger context. At the same time, the contribution derived from inventors spanning larger structural holes has less impact in response to the transaction (Paruchuri & Eisenman, 2012). Reasons are related to the anxiety generated by mergers which reduce inventors' abilities to manage resources and produce responses, while for inventors that work on structural holes, information is transmitted in non-overlapping channels of communications.

In conclusion, in this chapter, we analysed the main motives of high-tech acquisitions, namely the achievement of capabilities, knowledge, and technology resources, in a high-speed environment. Indeed, high-tech acquisitions aiming at specific-products or market share are not preparatory for obtaining the target capability since they provide short-term gains, which do not justify acquisition premiums. This is the reason why more competent acquiring firm look for real capabilities and knowledge. In line with the KBV, knowledge is the driver for competitive advantage in the high-tech sector, and, as such, it is a critical resource to transfer. At the same time, it can be easily compromised if the context is impaired as a consequence of target inventors' discomfort.

In the next chapter, we are going to present principal factors affecting performances of target firms and the way of measuring innovation levels .

3. Post-acquisition output & measurement of performance in high-tech sectors

3.1 Factors affecting performances of Target Inventors

The effectiveness of technology acquisitions firmly depends on the success of implementation and integration phases: the acquirer's experience is not the driver, rather considerations regarding the inventors' integration within the new entity, since even in transactions which involve seasoned parties, the knowledge resides in human capital, difficult to measure and to manage. Given its importance, the topic is extensively cover by existing research. In the next steps we will analyse in detail the factors that impact the acquired resource, which then determines the performance of the new entity and the new level of productivity, the subject of our research.

According to Ernst and Vitt (2000), there are two possible scenarios regarding an inventor following an acquisition. In the first scenario the overall productivity increases pushed by knowledge contamination, increase in scale of resources (both financial and personal) and cooperation. The second and less desirable scenario implies that the productivity of the combined entity doesn't increase or even worse, it decreases. There are different causes that can lead to a negative scenario, one is the uncertainty created in the acquisition phase (Chakrabarti & Souder, 1984), which can be outstretched even in the integration phase (Gerpott, 1995).

The merging of two R&D departments in one entity is likely to bring duplicate projects, and because of that, the management can decide to halt some of them (Lengnick-Hall, 1991). This inevitably brings uncertainty among inventors and can contribute to negative performances.

In previous studies, scholars have been able to identify factors that can lead the acquisition to a scenario of increased productivity or a negative scenario. The aim of this paragraph is to start analysing some of them to have an overview on the factors that undermine the output of an acquisition.

The **relative dimension** of the acquiring firms plays a crucial role in the innovation output of inventors following the acquisition. According to previous research, if the size of the acquired company is not relative too small with respect to the size of the acquiring firm, the productivity of the inventor is less likely to dimmish "inventors from acquired firms that are not small in comparison to the acquiring firms exhibit greater post acquisition innovation productivity" (Kapoor & Lim, 2007, p. 1148). According to the study, the reason is based on the fact that the greater the size difference, the grater the disruption in inventors' routine, which ultimately leads to decrease in productivity.

The second aspect is **relative standing** of inventor following an acquisition and the integration of the two entities. In fact, the organizational landscape of the target firm changes drastically: inventor that where central in the target company, could become less crucial and lose standing. The change in social status influences the productivity of an inventor.

Paruchuri et al. (2006) demonstrated that the productivity of a target inventor decreases following a decrease in relative standing.

Following an acquisition, as explained earlier, some inventors could feel demotivated and could lose social status and some of them even decide to leave (Roberts & Mizouchi, 1989). The decision of key inventors to leave, although it might have some advantages (i.e., increase of turnover and decrease in obsolescence) (Ernst & Vitt, 2000), usually entails negative aspects. The turnover implies time to recruit and form

new inventors (Zeffone, 1993) and brings a decrease in human capital, especially if the inventor are key and experienced inventors.

Two other influencing factors, which have a high impact on productivity (CEO Retention and Structural Integration) will be extensively discussed in next chapter.

3.2 Patent as a measure of innovative performance

As for now, we mentioned the negative impacts that an acquisition could have on innovation performances without specifying how to measure this change in productivity.

Trying to assess personal performances in the field of innovation is not an easy task, since there are not many objective measurements that can be used to evaluate one single inventor.

To have a quantitative and objective overview of innovation performances, historically it has been used primarily R&D expenses and patents data.

Although past studies shown a positive correlation between R&D expenses and likelihood to innovate, some limitations have to be considered: (i) the correlation between R&D and innovation is lower in high-tech than in low-tech sectors (Mairesse & Mohnen, 2004) and (ii) R&D expense is a measure of inputs for innovation rather than an output indicator.

Unlike other innovation performance indicators, being patens linked to a person, they allow to have a high flexibility on the granularity of the research. In fact, **patents can be used as an objective measure to evaluate innovation performances** of a single inventors, a business unit, or an entire company.

Another advantage of using patents as measure for innovation is that, since they must be registered, data are highly available and complete. Not only it is relatively easy to

access patent data, but information is stored using a highly standardized format, that allow immediate comparison and analysis.

When dealing with patent data, it is necessary to analyse the complications they have, for instance patenting is industry specific and it also depend on the country.

In section (3.2.1) the focus will be on past studies and statistical analysis based on patent data; in (3.2.2) it will be provided a guide on main indicators relying on patent data; finally, section (3.2.3) will focus on patent data limitations.

3.2.1 Patent as statistical indicators

Patents have since long been used as proxies for innovativeness in the research field, and as K. Pavitt explains, "The variety of analytical approaches to the use of the patenting statistics is matched by the variety of explicit or implicit assumptions as to what type of activity the patent statistics actually measure." (Pavitt, 1985, p. 80).

Patents have been considered in some cases as intermediate output of the innovation process (Hausman, Hall & Griliches, 1984), in other cases as proxies of invention and not innovation. According to Pavitt, patents should be used to measure innovative performances and not just inventive activities.

Early researchers used to rely on simple patent counting as a proxy of innovativeness, however Schankerman and Pakes (1983) demonstrated that using simple patent counting can result misleading. In fact, according to the study, the patents with high value are in relative smaller number with respect to the total number of patents. This raised the need for a measure of patent quality.

Starting from this need, researchers started adopting numerous indexes derived from patent as proxy for quality. A first index used has been number of citations (citation made from subsequent inventor) with a high number of citations symbolizing a high value of the patent. Together with number of citations, other two indicators that have

been adopted are: number of renewal and patent family size. When the protection guaranteed by a patent expires, inventors have to possibility to renew the validity through a payment of a fee. The family size instead represents the number of different offices to which the patent has been registered. These two indicators rely on the same basic assumption: inventors are incentivized to extend the validity in time or in different jurisdiction, only if it is worth it. Another measure used is the Grant lag index (i.e., the time between the application and registration of the patent). The shorter the time frame, the higher the value of the patent.

3.2.2 Patent based indicators

In this paragraph, we will explore in detail some of the quality indexes used in literature based on patent data, a further explanation of these indicators is provided in the Appendix.

Patent Scope

To each patent, following the International Patent Classification, it is associated one or more IPC code representing the technological categories it covers. The first 4 digit of the code (IPC4) represent the subclass of the patent.

Understanding the number of different subclasses, a patent is covering, is useful to estimate the technological breadth of the innovation.

For this study, we will adopt the index proposed by Lerner (1994) and it is computed as the sum of the distinct 4-digit IPC subclasses.

$$SCOPE_P = n_p \; ; \; n \in \left\{IPC_1^4; \dots; IPC_i^4; IPC_j^4; \dots; IPC_n^4\right\} \,\&\, IPC_i^4 \neq \; IPC_j^4, \tag{1}$$

Where n_p denotes the number of distinct 4-digit IPC subclasses.

Backward citation

When filing a patent, inventors must specify and report the knowledge they used. This is particularly useful to understand the level of innovativeness of the patent. According to studies, the higher the number of backward citations the higher the value of the patent (Harhoff, Scherer & Vopel, 2003). Nonetheless, the number of backward citations is proven to be negatively correlated with the degree of innovativeness of the patent, in fact a high number of backward citations can be linked to an incremental innovation rather than a breakthrough innovation (Lanjouw & Schankerman, 2001).

Forward citations

The number of forward citations of a patent represents the number of citations that future inventors made referring to that patent. This is clearly an indication of the quality and importance of the innovation (OECD).

When computing forward citation index, one should calculate also self-citations. This is because a study demonstrated that self-citations tend to be more accurate (Hall, Jaffe & Trajtenberg, 2005).

Family size

Once submitted a patent, inventors have one year of time to extend the validity and file the patent in other jurisdictions (OECD). This practice is used to guarantee the protection of the invention in other countries different from the one of the first application.

The family size of a patent is proxied by the number of applications of the same patent in different jurisdictions.

Since further applications in different jurisdictions are linked with additional expenses and are time consuming activities, it is assumed that it is done only when the patent

covers a valuable innovation. When using the family size indicator, it must be considered that it is influenced by regulation in different offices and for this reason it could be subject to delays. When setting timeframe to analyse these indexes, one should consider delays cumulated in the process.

Number of Claims

The patent offers intellectual protection only for the aspects an inventor claimed. The number of claims indicates therefore the validity of the patent. Having high number of claims implies higher costs, thus the same concept of family size is valid: inventors are keen to have a broad range of protection only if the innovation is worth it.

The number of claims is subject to a verification process that may reduce its number. Therefore, this index may include bias towards new patent which still have to be examined.

3.2.3 Patent based indicators' limitations

Using patent measures provides benefits but it also entails disadvantages, in this section we will start by resuming the benefits patent data provide, and then discuss about the limitation of these kind of indicators.

1. Doubtless, patents provide standardized way to catalogue innovation. Aside being complete, patent data contains lots of relevant information that can be used in subsequent analysis. Patents also allow for identification of innovation performance at business unit level (Ernst, 1998) and of companies which are not obliged to disclose R&D activities.
2. Patents are closely linked to invention (OECD, 2009).
3. Since patents are linked to a single inventor, it is possible to evaluate performances of single inventors, which is the aim of the dissertation.

However, it is also important to have an overview of the limitations and drawbacks of using patent data:

1. First, relying on simple patent counting can lead to deceptive results. As highlighted by Van Zeebroeck (2011) only few patents are valuable for the community, whilst most of them have never been applied.
2. Second, the use of patent is strongly dependent on the industry one is considering, and this can result in misleading conclusion when using patent as innovation performance in multi-industry studies.
3. Patent propensity does depend also on the dimension of the company (Cohen, Nelson & Walsh, 2000). Given high fees associated to patent registration, small firm are less likely to adopt this procedure. Thus, resulting in a possible underestimation of the innovation capabilities of a small firm. Moreover, the legal fee required to enforce the acquired right, can discourage small firms.
    1. Patent propensity is also different among countries (Cohen, Krishnamoorthy & Wright, 2002). Different regulation and different cost among offices in different countries can affect the validity of patent measures.
    2. Some patents are just used for strategic purposes, without the intention to create a tangible innovation, but rather filed with the aim of blocking other entities from creating new innovations (Gambardella, Giuri & Luzzi 2007; Motohashi, 2008).

Although these limitations may influence the results of a study, in the methodology section we will further explore the complexities of patent data and present countermeasures we adopted.

4. Implementation Strategies: Key Decisions

In this chapter, we will analyse which are the key decisions that drive a successful acquisition. As we reported in chapter II, acquisition literature largely agrees that post-acquisition performances depend on post-acquisition implementation which, in turn, involves several decisions; among them, two are for us strategical and require particular attention for the purpose of analysing the level of innovation. First, after the acquisition the main adjustment is related to the target CEO: the scenario of retention or replacement and even characteristics of the CEO contribute to define the aftermath performance of the company; then, the level of integration can enhance or disrupt the key role played by the target CEO; the *integration-autonomy dilemma* arises, which mainly features acquisitions with small high-tech target firms.

4.1 CEO Retention/Replacement

The CEO represents the highest executive position and, as such, it can introduce a unique value inside the firm. CEOs are precious resources and retaining them within the newly merged organizational entity can be a huge challenge: they are not physical assets; they are human resources, hence difficult to be managed. Sources of literatures analysing the reason why the retention/replacement choice is so strategical in the implementation phase are as many as linkages and cues which stem from this topic.

As mentioned in chapter II, the RBV supports the idea that the possession of good resources is essential for value creation; it follows that for many scholars the retention of target CEOs is a crucial element for the acquisition success, mainly because of her

positive effect on inventors. The reason why CEOs are worth to be analysed lies in the fact that they represent **a valuable human capital in the pre-acquisition period, and they can be source of value creation in the post-acquisition phase** (Barney, 1991). In the implementation phase, CEOs can support the acquiring firm in relieving the burden of some managerial activities putting on cross roles, not previously assumed. Furthermore, they indirectly have an alleviating effect on employees, needed to avoid inventors' departure and the disrupting effect on acquisition's performance. (Hussinger, 2010; Kapor & Lim, 2007). Following this line of reasoning, according to Graebner (2004), the executive manager is a moderator that mitigates the acquiring firm's demands and moderates target employees from probable organizational turmoil. CEOs are involuntarily authors of two actions: ***mobilization and mitigation***, which together allow inventors to maintain their level of productivity. In case of retention, the target CEO results to be the best person to restructure resources, applying mobilizing actions toward some changes that the acquiring firm desires: she knows the company; hence she can facilitate the implementation process. This allows to keep the productivity through a smoother implementation. At the same time, target CEOs can bring employees' concerns and voice to the acquirers, playing an "ambassadorial role" and psychologically protecting inventors from changes.

Barney (1988), who introduces the VRIN characteristics (see chapter II), presents another prospective based on the cost-benefits analysis to evaluate the relevance of the acquisition: if the future economic impacts allow to have superior results respect the cost to maintain the CEO (salary), then the acquisition will generate value. These findings have been the basis for the study of Wulf and Singh (2011) that consider the governance held by the acquiring firm determinant in defining the probability of CEO retention. Moreover, they observe a positive relation between the probability of retention of the target CEO and the salary received before the acquisition, signal of the

human resource's capability. Buchhlotz (1993) goes further, analysing possible conditions that influence the departure of the CEO: he shows the existing positive relation between relatedness and replacement coming from the redundancy of CEOs' skills.

Despite evidences supporting CEO retention, this is just a partial vision. At the base of acquisition literature, in the early 1990s, there was the agency theory (Manne, 1965). After the transaction, information asymmetries may arise causing what is known as the principal-agency problem, which strongly impacts on the success of M&A transactions. Target CEOs could be purely self-interested, acting in an opportunistic way. Taking on the shareholders' point of view, M&As appear to be good opportunities for replacing target CEOs with poor performances (Walsh, 1988; Jensen & Meckling, 1976; Fama & Jensen, 1983). Therefore, many scholars consider executive replacement as an acceptable/desired acquisition output**.** Krug, Wright and Kroll (2014) in "*Top management turnover following mergers and acquisitions: solid research to date but still much to be learned*", focus on CEO replacement, stressing the importance of this scenario as driver for value creation due to the relevant number of failed acquisitions caused by an inadequate integration. Indeed, many transactions are driven by the willingness to achieve cost-savings and eliminating redundancies, thus CEO replacement is a turning point able to enhance value. Their study amplifies the domain of analysis, bringing to the attention the context (external conditions where acquisition realizes) and aspects linked to the CEO's psychology.

Overall, it can be the case that replacement is better than retention, but when dealing with high-tech acquisition, given the nature of human capital and the value of knowledge, the role of CEO matters a lot: **CEOs moderate the negative impact of organizational changes**, becoming "soft coordinators" able to support the transfer of technologies and help in regulate the transaction (Graebner, 2004).

4.1.1 CEO's Characteristics

Since not all CEOs are alike, characteristics and status matter a lot in determining the output of the implementation phase. As cited before, CEOs are central in matching target and acquiring firms, implementing potential synergies. Therefore, the replacement decision should come after a deep assessment of the CEO's human capital, her knowledge, and specific capabilities. During their careers, CEOs develop specific knowledge, thus when the individual remains CEO, the firm is investing on firm-specific human capital (Becker, 1993; Buchhlotz et al., 2003). Moreover, some CEOs' characteristics can define the likelihood of retention/replacement, since they are individuals and as such their status, their experience, the roles assumed and their attitude impact on the decision of retaining the CEO or not.

Above all, it is well known that the founder status gives further unique properties to target CEOs. F**ounder-CEOs are the architects of the firm and as such they possess an incomparable knowledge respect to professional peers**. Since day one, they assume several roles and responsibilities (Jayaraman, Khorana, Nelling, & Covin, 2000), becoming involved in the definition of the firms' structure, strategy, and culture. By doing so, they transmit their "mark" to the firm, which will become the distinctive trait in future developments (Baron, Hannan, & Burton, 2001; Burton & Beckman, 2007; Nelson, 2003). From that, the growth of their tacit knowledge related to firm's operations and collective/individual capabilities of employees, which add to the charismatic leadership inherent to the founder status (Dobrev & Barnett, 2005). However, as time goes by, the company gets older and founder-CEOs tend to leave the management to professional CEOs to avoid that the firms' structure and routines become too standardized (e.g., Boeker & Fleming, 2010). A recent study developed by Aghasi, Colombo and Rossi-Lamastra (2021) argues that in technological driven acquisitions, where the target firm is a small high-tech firm, the likelihood to retain the

target CEO is higher when the latter is the founder. Indeed, the more the acquiring firm perceive the target CEOs as VRIN assets, the more they are inclined to retain these individuals.

Besides founder status, **CEO tenure** is an interesting distinguishing, not so inspected, which **affects CEOs' *modus operandi*. The more the time spent within the firm as CEO, the more the expertise developed becomes specific to that firm** (Coffee, 1988). This is a key resource for the company, since as CEOs tenure increases**,** so does their commitment toward the company. CEOs are more inclined to develop configurations of processes, strategies and structures that becomes cohesive (Miller & Friesen, 1984) and successful, especially with longer-tenured CEOs. Their expertise makes them even more valuable compared to other CEOs and thus their departure means losing their tacit knowledge. There are opposite opinions in the existing literature to the extent that it is not clear whether long-tenured CEOs represent more precious human capital in high-tech acquisitions; someone analysed the impact of CEO tenure toward the changes in approaching to innovations (Musteen, Barker & Baeten, 2010), while others studied the relationship between CEO tenure and R&D intensity. Then Zhou, Datta and Zhu (2020) explore the relation between CEO tenure and M&A decisions. Despite these studies, mechanisms that bring the CEO's experience within the company to influence the firm's performance remain unexplored (Simsek, 2007; Luo, Kanuri & Andrews, 2014) and give the stimulus to advance hypothesis regarding the topic.

Eventually, a rich stream of literature highlights specific consequences of **CEO duality** on the acquisition success; the situation in which the CEO is also the chairman of the board of directors **defines the balance of corporate power between firm management and the board of directors.** The combination of the two positions gives further power to the CEO (Zaccaro, 2002): she is the head of the board and has control over the agenda at the meeting, she manages information coming from other directors before board

meetings, and she is able to guide the discussion during the meeting itself. When dealing with CEO duality, there are opposite school of thought: on one side, **the stewardship theory supports that CEO duality could have positive effect on firm' performances**, since the concentration of decision management and decision control in one person leads to a more coordinated unity of command at the firm; it follows that the effectiveness and the productivity of the firm improves, increasing shareholders' value (Zaccaro, 2002). On the other side, the combination of the CEO position and chairman of the board makes the CEO overpowered (Zaccaro, 2002); therefore, **according to agency theory, this "promotes CEO entrenchment by reducing board monitoring effectiveness"** (Dalton, Daily, Ellstrand & Johnson, 1998, p. 271). Indeed, duality may also lead to conflict of interests among directors or to the domination of the firm management over the board of directors. In conclusion, there are no ambiguities regarding who guide the ultimate power, having one unique person or two different people.

4.2 Integration-Autonomy Dilemma

The previous section brings out the focal role of target CEOs in high-tech acquisitions during the implementation phase, from which derives the necessity to give them the right autonomy and thus obtain desired results regarding inventors' productivity. The decision related to the level of autonomy against the integration strategy takes the name of "Integration-Autonomy dilemma". Acquiring companies have two opportunities: on one side, integrate the target firm and directly access and control its capabilities, with higher degree of coordination required; on the other side, provide autonomy to preserve the target's ability to continuously explore and innovate, which is actually the main scope that drive a high-tech acquisition. In these transactions, the definition of the proper balance between the two dimensions is a relevant challenge since **technology transfer needs high-level of coordination, but on-going developments require higher autonomy**. Given the relevance and the impact of the choice, many are the studies which extended motives and consequences of the two aspects.

Puranam et al. (2006) solve the dilemma looking at the innovation stage of the target with respect to its innovation trajectory, where the exploration and exploitation phase alternate each other; the authors demonstrate in high-tech acquisitions the structural integration is optimal when it does not coincide with the explorative intensive phase for which autonomy is required. Puranam, Singh and Chaudhuri (2009) continue the analysis with the article *"Integrating Acquired Capabilities: When Structural Integration is (Un)necessary"*. Here the focal point lies on two pre-existing conditions to structural integration which suggest the best structure to adopt. The first one is **common ground**, defined as "the sum of their mutual, common or joint knowledge, beliefs and suppositions" (Clark, 1996, p. 93), which implies informal coordination; the second

condition is the existence of **interdependency**, meaning that changes in one firm impact on the other, thus pushing the two entities to structural integration.

Many scholars studied separately CEO retention/replacement and the structural form of the target after the transaction; however, it is good to have a transversal view regarding the two dimensions due to the fact that they are intertwined: the structural integration might influence the decision of retaining the target CEO, and vice versa (Aghasi, Colombo & Rossi-Lamastra, 2017). In line with Thompson (1967), structural integration means coordination, while separation implies autonomy. At the same time, as previously mentioned, CEO retention allows the target firm to keep higher autonomy and "soft coordination" (Graebner, 2004). Therefore, dealing with high-tech target companies, acquiring firms realize the need of giving higher autonomy to target companies and the necessity of keeping CEOs as form of coordination. Indeed, in these cases the autonomy is seen as facilitator of innovations (Puranam et a., 2006) but a higher level of coordination is required if the object is to obtain the tacit knowledge of the target firm (Ranft & Lord, 2000). Aghasi et al. (2017) bring together the two streams of literature, defining the below reported scenarios (Figure 5).

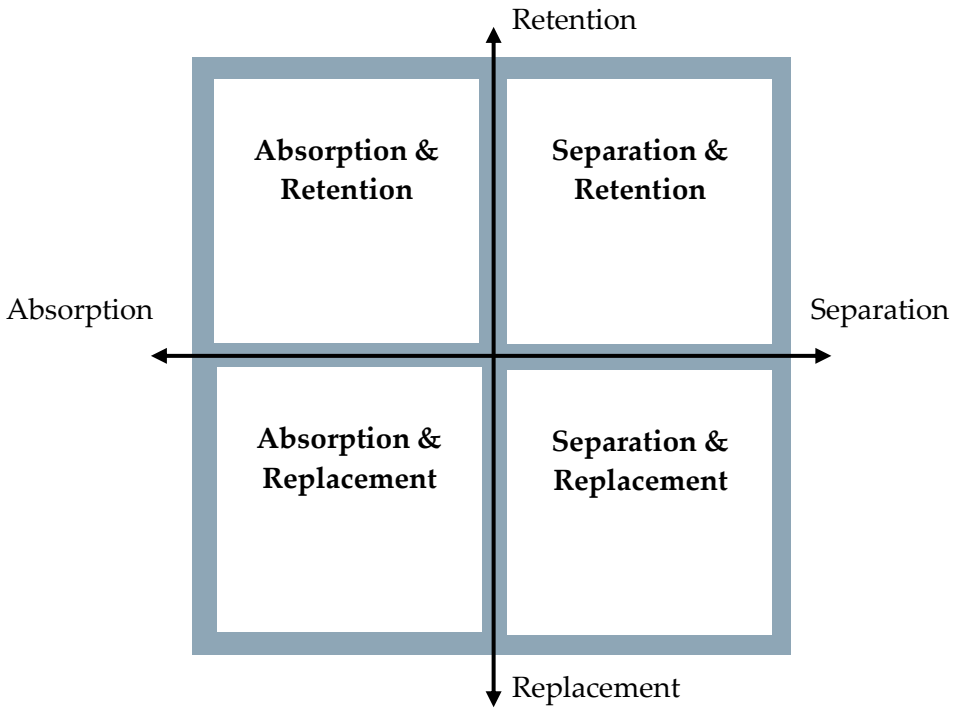


Figure 5 - Matrix of Retention/Replacement & Absorption/Separation

The matrix picture four combinations of whom two represent hybrid solutions. In particular, *Separation and Replacement* includes the acquired firm separated from the target one and it replaces the target CEO with another one as form of control for the acquiring. Replacing the target CEO means changing the head of the organization, that holds control over operations and guarantees alignments of goals. This implies a level of autonomy which is lower with respect to the retention strategy but higher than the absorption case. Then, *Absorption and Retention* means structural integration of the target firm which keeps its CEO. Absorption implies better coordination with disruption risks, and retention preserves some level of autonomy thanks to the target CEO that can realize mitigation actions (Graebner, 2004). Aghasi et al. (2017) demonstrate that in high-tech acquisitions **coordination can be obtained even with a certain level of autonomy, through the combination of CEO retention/replacement and the structural form chosen post-acquisition.**

5. Research question and hypothesis

5.1 Literature Gap and Research Question

In the second chapter, we discussed ongoing trends in the M&A market. As stated, M&As have gradually grown to become one of the key steps to pursue a business strategy. Acquisitions are usually driven by various reasons including but not limited to geographical expansion, product portfolio expansion and acquisition of knowledge.

Following the increase in the number and complexity of M&As, many researchers have studied this phenomenon, with an explicit focus on reasons and best practices for successful post-acquisition implementation. The reason why scholars give attention to the implementation phase is linked to the high importance that it plays in determining a successful acquisition. According to Susan Cartwright (2002), 80% of transaction fail to meet expectations and the main reason behind this failure is the inability of acquiring managers to integrate and valorise acquired resources.

As extensively explained in the previous chapter, implementation is particularly relevant in technological acquisitions. In fact, when dealing with high-tech acquisitions, it is evident that **inventors represent the source of knowledge and capability** within the target company and, being the most sensitive and precious elements, many factors can undermine their innovativeness following an acquisition (see chapter III), which in turn determine the failure/success of the high-tech acquisition.

Given the importance that the implementation phase entails in determining the result of an acquisition, a new stream of research focus on managerial decisions during post-acquisition emerged.

Above all, the CEO retention and the structural form assumed by the two entities following the transaction represent key decisions to be taken in order to successfully implement the acquisition (see chapter IV). Aghasi et al. (2017) combine the two-dimensions identifying a new matrix which resume four possible scenarios (e.g., Absorption & Retention, Separation &

Retention, Absorption & Replacement, Separation & Replacement). What can be derived is **that CEO retention is a necessary condition to grant autonomy to target firm** and for this reason has a high impact on post-acquisition productivity. Indeed, technology acquisitions which involve small high-tech firms need to have the right compromise between autonomy and coordination: as matter of facts, the autonomy enhances the role played by the target CEO within the firm which automatically impacts on inventors and their way to be productive.

Secondly, a study of 2015 by Angwin and Meadows analysed post-acquisition performances with respect to the retention or replacement of the target CEO. They evaluated impact that different CEOs may have on productivity by focusing on leadership styles (degree of assertiveness, accommodativeness, and adjustment to politics). Their study, together with other researchers investigating the effect of different leadership styles on productivity (Kesting, Ulhøi, Song, & Niu, 2015), suggests that **CEO characteristics are worth to be analysed** when evaluating change in productivity of employees. Angwin and Meadows goal was to evaluate performances subordinated to CEO's characteristics, however, trying to assess acquisition output is especially difficult in technological acquisitions, in which, according to the KBV, explained in chapter II, a company's innovativeness level is the result of the interaction of knowledge within the company.

The limitation of their study of Angwin and Meadows (2015), is that when considering players involved in technological acquisitions, financial or economic performances might not be the most accurate measures. In fact, technological acquisitions are characterized by relevant player taking over small companies, and for this reason, observing the impact of the acquisition based on economical result might difficult. For this reason, it should be used an indicator related to innovative performances. Based on this need, researchers have relied on the patent as quantitative proxy measure for output. These researchers in their studies (e.g., Henderson & Cockburn, 1994; Dutta & Weiss, 1997; Ahuja & Morris Lampert, 2001; Kaplan & Vakili, 2015; Harrigan, Di Guardo, & Marku, 2018; Harrigan & Di Guardo, 2017) evaluated post-acquisition performances (increase or decrease in innovativeness based on patenting activity), focusing on variable related to firm-level (e.g., market relatedness, technological relatedness).

In conclusion, although some researchers have studied the impact that CEO retention has on post-acquisition productivity, what is missing is a comprehensive study analysing how the retention of different CEOs' (in terms of personal characteristics) influence inventors' performances by adopting appropriate innovation measures. This is why our dissertation in not limited in understanding pure retention, but instead have a specific focus on different CEO characteristics.

How does the retention of the target CEOs influence the innovative post-acquisition performance of target inventors?

How do CEOs' characteristics moderate the effect of their retention on inventors' performances?

5.2 Hypothesis definition

5.2.1 CEO retention

The main hypothesis of our dissertation is linked with the strategic decision regarding the status of the target CEO after the acquisition.

As said in chapter IV, there are plenty of studies in the M&A literature assessing the impact of CEO retention. Past studies demonstrate that in many acquisitions, target CEOs leave the company in two years from the completion of the deal (e.g., Buchholtz et al., 2003). However, there is still unclear picture with respect to whether and why the acquiring firm should retain or replace the target CEO.

In some cases, replacements could appear as the best option, especially with an ineffective target CEO. However, leveraging on the RBV (Barney, 1988,1991), target CEOs improve the acquiring firms because of the type of resource that they represent (i.e., VRIN).

A study by Bargeron, Schlingemann, Stulz and Zutter (2009) shows that the retention is positively correlated with firm performance; similar results arose from a study by Cannella and Hambrick (1993). This stream of research is interested in studying CEO retention since acquisition is a disruptive event, and the retention of the CEO can mitigate disorientation among inventors (Graebner, 2004).

What it can be derived is that the target **CEO is in the best position to monitor the implementation process and deploy strategic decisions**. In small high-tech firms the role of the CEO is even more prominent since these companies do not have a dedicated management team, hence most operations and strategic decisions pass through the CEO that needs to initiate/agree.

In particular, acquired top management can contribute to successful implementation by adopting mobilizing and mitigating actions (Graebner, 2004). Especially in

technological acquisitions, mobilizing actions are needed to overcome the "impasse" that may originate in the implementation phase. In fact, as stated in chapter II, being time one of the reasons behind technological acquisitions (Puranam, Singh & Zollo, 2006; Ranft & Lord, 2002), losing momentum may result fatal. Graebner (2004) clustered mobilizing actions in two separate groups: internal pacing (needed to guide employees through tangible goals) and accelerated coordination (to facilitate interaction with the acquired firm). Since acquiring managers suffer from information asymmetry, the target CEO is in the best position to perform these actions and guarantee a smooth integration.

Mitigating actions refers to those actions needed to reduce the target employee' s discomfort in the implementation phase. Negative feelings could lead to a decrease in commitment (Sales & Mirvis, 1984; Buono, Weiss & Bowditch, 1989; Schweiger & DeNisi, 1991; Nahavandi & Malekzadeh, 1993) and, in turn, decrease in productivity, or worse could push employees to leave their job (Hambrick & Cannella, 1993). This is a concern specifically in the technological acquisition, where knowledge workers' departure means a loss in value for the acquiring firm (KBV). In fact, as said in chapter II, "the knowledge depends on a complex and path-dependent context, and it can be completely jeopardized if the context is disrupted".

Moreover, by exploiting CEOs experience and firm-specific knowledge, it will be easier to find and apply synergies that will increase the value of the acquisition. In fact, as outlined by Graebner (2004), following an acquisition, one could expect from a "serendipitous scenario" in which unexpected synergies will increase the value of the transaction.

To resume: without retaining the CEO, the acquirer loses a facilitator in the integration process, and the probability for a cultural shock for inventors will increase.

In light of what is stated above, we can derive the first hypothesis:

H1: Target CEO retention has a positive effect on the productivity of target inventors in the post-acquisition period.

5.2.2 Founder-CEO

Previous studies on the discord of post-acquisition retention/replacement of target CEOs (e.g., Bergh, 2001; Buchholtz et al., 2003; Wulf & Singh, 2011) overlook the case in which the CEO is also the founder of the target firm. As reported in chapter IV, Aghasi et al. (2021) demonstrate that target founder-CEOs have better abilities in managing the implementation strategy post-acquisition, thanks to their firm-specific human capital and the monetary incentives perceived. Moreover, Lee, Kim and Bae (2020) analyse the effect of CEO on companies' performances and demonstrate that firms managed by founders show a higher level of innovation.

Past literature suggests that **founder-CEOs play a central role in shaping the company's culture and long-term view** (Baron et al., 2001; Burton & Beckman, 2007; Nelson, 2003), especially in high-tech sectors. Furthermore, founder-CEO tend to be perceived by employees as **charismatic leader** in comparison to non-founder-CEOs (Dobrev & Barnett, 2005). These two characteristics (i.e., charismatic leader and higher knowledge of the company) may facilitate her job in the implementation phase. Mobilizing and mitigating actions can be performed even more effectively by CEOs who are tightly linked to the organization and that are positively perceived by subordinates. This in turn, will reassure and guide inventors by reducing disruptive effects of mergers that compromise inventors' work within the company. Finally, founder-CEO is characterized by a **unique commitment towards the firm and the employees** which enables her to fully devote to guarantee a successful implementation phase.

Considering what said above, we hypothesize that since founder-CEOs are more effective than non-founder-CEOs in managing resources (i.e., knowledge workers) in their firm during the post-acquisition phase, their retention has a stronger positive impact on inventors' productivity.

> *H2: If the target CEO was a founder of the target company, her retention has a stronger positive impact on the productivity of target inventors in the post-acquisition period*

5.2.4 CEO tenure

Another interesting distinguishing is the **target CEO tenure** defined as the number of years, at the time of the acquisition, for which the CEO has had executive powers.
In the previous chapter we described the importance of CEO tenure in developing firm-specific capabilities (Coffee, 1988), which result useful in deploying effective mobilizing actions during the implementation phase. Longer-tenured CEOs are those that accumulated more experience within the firm and, thus in the implementation phase, the coordination between acquiring and target firm is better off. Moreover, the experience gathered within the target firm, allow target CEOs to develop a deep knowledge of the human resources they oversee. Consequently, target CEOs can exploit their understanding of human resources' dynamics and help them in diminishing disruptive effects of the post-acquisition phase.
However, literature presents competing viewpoints regarding tenured CEOs: on the one hand, they could be entrenched and have a myopic view of the work environment (e.g., Audia et al., 2000; Finkelstein & Hambrick, 1996); on the other hand, tenured CEOs may be able to take smarter decisions thanks to their familiarity with the target firm (e.g., Hambrick & Fukutomi, 1991). In line with this latter view, an interesting

study is provided by Zhou, Dutta, and Zhu (2020), exploring the relation between CEO tenure and M&A decisions. They obtain that long-tenured CEOs make better M&A deals that have higher returns around the announcements and, hence, receive higher compensation compared to the phase before the acquisition. As cited in chapter IV, as far as we know, the CEO tenure characteristic remains quite unexplored, especially for what concerns the mechanisms that connect target CEOs and inventors' performances. We will fill the gap by focusing on the CEO tenure as mediator of the effects generated by CEO retention on the inventors' performance.

In conclusion, our hypothesis is that, thanks to a deeper firm-specific knowledge and experience gathered, longer-tenured CEO are able to perform more effective mobilizing and mitigating actions. As said above, without these actions, it will be more difficult realizing those changes desired by the acquiring firm, resulting in a more complex implementation process.

> *H3: The longer the CEO played an executive role in the target company, the stronger the positive impact of her retention on the productivity of target inventors in the post-acquisition period.*

5.2.5 CEO duality

A third characteristic worth analysing is whether the CEO has different roles within the target company. In particular, we are interested in isolating the effect that a CEO, who is also the Chairman, has on post-acquisition productivity.

This characteristic is worthy of investigation as there is a considerable body of literature addressing the importance of separation between management and control. The role of the chairman of the board is to ensure alignment between shareholders' interest and decisions taken by upper management (executives).

When these two roles collide under a unique person, some concerns may arise. The topic is widely studied; as explained in chapter IV, literature demonstrates that duality confers higher power to the CEO (Zaccaro, 2002) and reduces monitoring effectiveness (Dalton, Daily, Ellstrand & Johnson, 1998). Given the absence of a board able to act as an intermediary to control the executive manager, the result is the worsening of the principal-agent problem. In particular, the CEO acquires unique power to make strategic decisions and to lead the company outside shareholders' interest. This phenomenon is often referred to as "**management entrenchment**" (Shleifer & Vishny, 1989). The effect that it could have on the organizations is considerable, especially in post-acquisition phases. In fact, dual-target CEOs can impose suboptimal post-acquisition-strategic decisions (i.e., retention, integration) leveraging high bargaining power. But even more importantly, in a delicate period such as the implementation phase, entrenched and power-seeking CEO will **neglect inventors' serenity in favour of personal ambition and thus alimenting disorientation and confusion among acquired resources.** As said, target CEOs are crucial in determining through mobilizing and mitigating actions whether an acquisition will succeed. Our hypothesis is that entrenched CEO fails to perform effective mobilizing actions between the acquired and the acquiring firm because, given the difficulty of the acquirer to control her, there is a substantial risk of free riding.

Moreover, busy in the process of retaining control and gaining power in the new entity, dual-CEOs fail to mitigate discomfort among inventors' and, thus, to create a stable environment.

In conclusion, our hypothesis can be resumed as follows:

> *H4: If the target CEO was the Chairman of the target company, her retention has a negative impact on the productivity of target inventors in the post-acquisition period.*

Part II – EMPIRICAL ANALYSIS

6. Methodology

The research question of this dissertation derives from the willingness to investigate the innovative level of production following a M&A activity; in particular, we want to describe the **impact of acquisition on the target employees' innovation level, considering CEO retention/replacement and her characteristics.**
In order to test it, we analysed a sample of acquisitions that took place in the U.S. high-tech industry, in a reference period of 15years (2001-2015). All these transactions are characterized by large and well-established buyers, while target companies are small and medium-sized enterprises (less than 500 employees). Target inventors are the subject of the performance analysis, whose productivity level will most likely be affected at a higher extent with respect to the one of the acquirers: inventors might improve their patent production or, on the contrary, completely stop.

The core of the work lies in the process of collecting, cleaning, and integrating databases, containing data related to two periods (i.e., 2001-2005 and 2006-2015) and different views (i.e., Patent Level, Inventor Level, and Firm Level), to make them coherent and harmonized. Challenges occurred during merging process since databases presented different frameworks. Firm to Patent, the level of observation changes and the degree of granularity and completeness, provided by patent databases, increases. Not by chance, the majority of data is devoted to patents'

profiling: patent data are used as measure of innovative production (e.g., Ahuja et al., 2001) at all levels, making it possible to compute performance indicators related both to the quality and to the number of patents generated by each inventor under observation.

The methodology chapter refers to the process followed to build the mathematical/econometric dissertation. Section 6.1 elaborates on the sources for data collection. Section 6.2 describes the steps followed to build the entire sample. Variables' definition is presented in section 6.3, while 6.4 reports the model specification.

6.1 Data Collection

Data have been gathered since 2018 from several open-source databases: Unites States Patent and Trademark Office (USPTO), the European Patent and Trademark Office Database (EPO) and the Japanese Patent and Trademark Office Database (JPO), defined by the Organization for Economic Cooperation and Development (OECD) as triadic patent offices (Hicks et al., 2001).

Primary sources of data were PATSTAT, Patentsview, Patent Network Dataverse and NBER. The first one has a worldwide coverage, key aspect for defining patent quality and differentiate first filing form family patents; the second one has demonstrated to be the most reliable database for its completeness and consistency of data, particularly effective in terms of patents' disambiguation; the third one was employed to overcome limitations of Patentsview: it collects and processes patents data from the National Bureau of Economic Research (NBER) and from the distributions of patent data of the USPTO. Secondary sources were Online Databases which provide easier accessibility

and real-time information; in particular: PATSTAT, PaFT and ESPACENET. Moreover, PATSTAT Online was used to countercheck and re-computing relevant indicators at inventor level. Finally, specific criteria were followed for data collection:

- first, just **American Companies** operating in high technology industries were selected, with their respective inventors
- second, only **successful patent applications** were considered, and non-US-transaction were eliminated due to the type of challenges which affect these companies
- third, the **filing date for the simple family** was considered as the referential date of each patent
- fourth, the final patents filed considered were those related to the **-5/+5 years** with respect to the acquisition.

6.2 Sample description

As mentioned above, this research focuses on the merging process realized on a huge amount of data and the subsequent attachment of several variables which enriched the initial databases. The work was performed mainly on the 2006-2015 sample and then integrated with data belonging to 2001-2005. The following subsections describe all steps that led to the creation of the final sample.

6.2.1 Context Variables - LexisNexis

With the purpose of obtaining data regarding a set of acquisitions, the "Merged Thompson-Zephyr" database (provided by Professor Keivan, see Annex 1) was analysed. The latter reports general (e.g., Nation, State and City) and economic (e.g., EBIT, EBITDA) information about acquiring and acquired firms involved in 319 acquisitions, which took place in the U.S. market between 2006 and 2015, in the high-tech sector.

Starting from it, we used LexisNexis to gather news about each transaction. LexisNexis is a bibliographic and regulatory database of international importance, mainly academic, in the legal and economic-financial field. It is structured as a library and divided into sections gradually more specific. The available material ranges from magazines, company profiles, market reports and research, government documents and international legislation related to United States, the United Kingdom, the Commonwealth countries, and the European Union. All the documents, coming from over 15,000 sources, are available in full text. A substantial part is devoted to news and content from major newspapers, including Financial Times and The New York. The relevance of this source relies on its rich interface which makes easier to get a comprehensive and clear view about the several functions.

Downloaded news were about the context of acquisitions, the aim was to ensure they had technological motivations in nature and target companies were not subsidiary of other companies, but rather independent entities at the time of acquisitions. Besides, the contextual data from Lexis Nexis allowed to identify CEOs of target companies at the time of acquisition; however, whenever the platform did not provide useful information, LinkedIn was used to investigate target CEOs.

At the end of this step, 228 CEOs related to so many acquisitions were identified: starting from a sample of 319 transactions, in many cases the target CEO was not cited or not identifiable in the news.

6.2.2 CEOs' variables

To capture the impact of CEO retention or replacement on the innovation productivity, it was necessary to collect data related to the target CEOs' life. Several sources were used to obtain CEOs' *Curriculum Vitae* (CV), or to find, at least, cues to construct them. LinkedIn was employed as primary source of data, while Bloomberg, Zoom Info and others, as secondary.

LinkedIn is a business social network with the scope of providing users' profiles which retrace their academic and professional path. Each user can freely subscribe the platform and add all her data about past formation, career, and other activities. It is considered a powerful tool for job application because it actually requires same information usually reported in a traditional CV. Despite appearing the perfect source for CVs, not all CEOs have a LinkedIn profile: some of them do not report their entire educational path or add just the university attended without the time or type of study; while others are aged and hence not used to exploit social networks. Therefore, we approached to secondary source of data whenever LinkedIn pages were not available, trying to build the past educational and working life of our CEOs.

According to each transaction code, information added at this stage are related to crucial steps in the career of the CEO and her personal background, such as: personal information (i.e., name, surname, gender); year of arrival, year of exit, year in which her became the CEO and age at the acquisition, founder's status, roles played within the target company and possible individual replacement (binomial variables: replacement occurred within 1 or 3 years), educational background.
Ultimately, the integration of CEOs' data at Inventor Level was executed, using as driver the transaction code (an identifier for each transaction) (see Annex 3.2).

6.2.3 Inventors' name harmonization

Each inventor should be recognized by a unique identifier, essential to effectively delineate the patenting activity of the target inventor. However, this process of distinctively identifying the inventor generated not negligible challenges in the academic literature. The main reason is the lack of standardization, which makes more difficult to identify inventors who have the same name/last name or those who have identical names but are different people, leading to a possible underestimation or overestimation of patents. In addition, incomplete data on female inventors who have changed their names due to marriage may also cause mismatches (Hoisl, 2007).
A clear example is *Rgis Le Couedic*, that produced a patent, and *Regis Le Couedic*, that worked on another patent (Figure 6). Both the entities worked for ABBOTT SPINE INC., inventing similar products and lived in the same place. Can we suppose that the two inventors are, in reality, the same person?

Inventor	First Name	Last Name
6368320-1	Rgis	Le Couedic
6368320-1	Rgis	Le Couedic
6368320-1	Rgis	Le Couedic
6368320-1	Rgis	Le Couedic
6090113-1	Regis	Le Couedic
6368320-1	Rgis	Le Couedic

Figure 6 - Example of wrong inventor's name from the patent level database

According to Smalheiser and Torvik (2009), issues that need to be faced dealing with disambiguation are the following:

1. A single person can publish **under several names**
2. Many individuals have **the same name**
3. **Metadata** necessary to distinguish between individuals are often incomplete or completely lacking
4. Not only is increasing the percentage of scholarly articles **multi-authored**, but they also involve **multi-disciplinary and multi-institutional efforts**

In this regard, relevant results have been achieved by Stein, Hoppe and Golluh (2012) that measured the impact of spelling errors in patent studies: they got that 98% of a set of patents (from USPTO DATABASE), contained errors, mainly spelling ones. The principal motive is that applicants' names are registered in public database according to different conventions and without controlling the logic used in previous submissions.

6.2.3.1 Patent Level

At this point, data related to inventors (inventor id, name, and last name) were already disambiguated through the Patentsview Algorithm; however, since data correction can be lower than 100%, we proceeded manually in correcting wrong inventor's data, which otherwise would negatively affect the statistical analysis.

For each acquisition, repeated or wrong inventors were retrieved. Mistakes were related to spelling's errors or similar way to call the inventor (see an example in Figure 7), which actually led to associate different "inventor id" to the same person with the wrong name/last name. Among different inventor id, we firstly selected the name/last name used at the most, or simply the correct one (grammatically), and secondly harmonized the others according to the former.

Inventor	First Name	Last Name
3931354-2	Robert J.	Jones
3931354-2	Robert J.	Jones
4437857-2	Robert	Jones, IV

Figure 7 - Example of wrong inventor's surname from the patent level database

6.2.3.2 Inventor Level

The unit of observation in this dissertation is an inventor who filed patents at the target firm in the five years before and after the transaction. This is the reason for progressively restructuring and aggregating available datasets to make them more functional for the analysis, passing from the firm to inventor to patent as unit of observation.

Main issues regarding disambiguation arose looking at key figures reported at the inventor level, namely: Claims, Backward Citations, Forward Citations, Citations to Not Patent Literature, Renewal, Patent Scope and Quality Index.

Whenever an inventor's name presented mistakes or was reported twice (or more times in different ways), the inventor had to be completely embedded in the "correct" existing inventor (under the same name with the most used inventor id, working in the same target company), coherently with the process realized at the patent level. Then, in order to adjust the key figures, we adopted three approaches:

- Claims, Backward citations, Forward Citations, Citations to Not Patent Literature and Renewal, expressed as total sums, were adjusted adding to the total the value of the "wrong" inventor. This addition was performed after having controlled common data with PATSTAT Online, an online database for patents, easily accessible from local networks or the Internet.
- Patent Scope was modified according to some controls performed through SQL codes on PATSTAT online: it requires an understanding of the SQL language (SQL queries for data recovery). Limitations related to computing power were overcame since data to be checked were relatively small.
- Quality indexes (4 and 5) were arranged considering a weighted average, using as weights patents produced by each inventor.

Starting with 3525 inventors, downward the adjustments data resulted to be 3371, belonging to 2006-2015 period. Consistent with previous studies (Kapoor & Lim, 2007), inventors that after the acquisition date patent elsewhere are considered within the sample but actually are "leavers", and hence their indicators have null values. The analysis was carried out on "stay" inventors, those who left the company after the completion year. Then, the focus remains on "active" inventors whose performance can be detected through patent analysis (according to several past studies, e.g., Kapoor & Lim, 2007).

6.2.4 Inventors' Metadata

As matter of fact, inventors seem to follow a specific life cycle: going forward in their careers, their invention productivity decreases (Levin & Stephan, 1991). With the purpose of keeping track of inventors' past career, LinkedIn pages allow to easily analyse the professional history of inventors. We leveraged on "Png LinkedIn Patent Inventor FIVE Data" file (provided by Professor Keivan) to obtain LinkedIn URL. The database belongs to the "FIVE Project" on Firm and Industry Evolution and Entrepreneurship, organized by Constance Helfat (Tuck School of Business at Dartmouth). Information cover 210554 observations of the career histories of 14293 inventors with patents and public LinkedIn profiles; data encompass information on individual inventors, their patenting history, and their employment mobility. Moreover, the file takes advantage of the Harvard Patent Inventor Database (Li, Lai, D'Amour, Doolin, Sun, Torvik, Yu & Fleming, Research Policy, 2014) to compile career histories and the usage of the lower bound of matching. This last index, together with the upper bound, is a variable created by Harvard Patent Inventor Database for the identification of inventors; we used it for associating the inventor to his LinkedIn URL contained in the Png LinkedIn Patent Inventor FIVE Data file and reporting it in the Inventor Level.

6.2.5 Merging Process

In conclusion, in order to define the complete sample of data related to 2001-2015, it was necessary to implement a merge between the databases of different years, by standardizing columns' names and adding missed variables (e.g., CEO patenting: binomial variable which assumes value equal to 1 if the CEO was an inventor, 0 otherwise). The result was Patent Level, Inventor level and Firm Level (see Annex 2, 3, 4).

We obtained:

- **243** acquisitions at firm level
- **4151** inventor id at inventor level
- **410** inventors with a LinkedIn URL at inventor level
- **964** active inventors at inventor level
- **551** "leavers" at inventor level
- **4074** target CEOs at inventor level
- **18071** patent id at patent level

6.3 Variables

6.3.1 Dependent Variables

In order to study the level of innovation of the target inventors after the acquisition considering the impact of CEO retention vs replacement, we choose three dependent variables able to measure changes in productivity and variations in patent quality. In doing so, we aimed to determine data about patents produced (quantity) and to capture the technological and economic value of innovations (quality) since the pre-acquisition phase.

- **Change Inventor Productivity**

  The variable describes the difference between the number of patents generated by the inventor in +5/-5 years respect to acquisition (see Equation 2):

$$\Delta Patent\ Productivity = \#Patents\ (0;+5) - \#Patents\ (-5;0) \quad (2)$$

  Each inventor's pre- and post-acquisition patent productivity has been measured considering in both cases a time window of five years.

- **Change Inventor Patent Breadth**

  This value measures the difference between average breadth of patents generated by the inventor in +5/-5 year respect to acquisition (see Equation 3).

$$\Delta Breadth = Average\ Breadth\ (0;+5) - Average\ Breadth\ (-5;0) \quad (3)$$

  "Change Inventor Patent Breadth" measures the diversity of the overarching technological domains underlying the inventive claims of a patent (Khachatryan & Muehlmann, 2019). It takes its origin from different theories. Lerner (1994) realized that the breadth of patents in firm's portfolio affects the firm's value and that patents with a relevant breadth are more attractive when many replacements are eligible. He proposed an index that determines the extent of the patent in terms of the number of different 4-digit subclasses of the International Patent Classification (IPC). The index is described as expressed by the Equation (4) (Squicciarini, Dernis & Criscuolo, 2013):

$$SCOPE_P = n_p\ ;\ n \in \left\{IPC_1^4; \dots; IPC_i^4; IPC_j^4; \dots; IPC_n^4\right\}\ \&\ IPC_i^4 \neq\ IPC_j^4 \quad (4)$$

Where n_p is the number of different 4-digit IPC subclasses. Thus, as the number of distinct 4-digit IPC classes increases, the broader the index and the higher the technological and market value of the patent. Subsequently, Matutes et al., (1996) analysed patents based on their duration and breadth, advancing the proposal regarding the fact that a patent should be used to encourage early disclosure of basic inventions

- **Change Inventor Patent Quality Index 4**

  This index is a composite indicator based on four basic patent qualities: forward citation, size of the patent family, number of claims, backward citations. It allows to capture both the technological and the economic value of innovation. It is computed as the difference between the average quality index 4 generated by the inventor in the five years before and after the acquisition.

$$\Delta Quality\ Inde = Average\ Quality\ Index\ - Average\ Quality\ Index\ (-5;0) \quad (5)$$

It is relevant to highlight that the original formulation derives from Lanjouw and Schankerman (2004) that weigh each component of the indicator using factor analysis. Differently, the OECD formulation weighs each component for the same weight. This has been decided since from the explanatory analysis came out that weights differ between the various technological fields and depend on the time span considered. Therefore, OECD decided to assign equal importance to all components, giving space for future research regarding the identification of coefficients that best reflect the relative importance of the various quality factors.

6.3.2 Independent Variables

CEO Retention

Past literature related to acquisitions underlines the importance of implementation strategies regarding retention-replacement of the target CEO. Wulf and Singh (2011) studied the role of governance in retaining successful target CEO, Buchholtz et al. (2003) focused on the role of human capital in post-acquisition CEO departure, while Aghasi et al. (2017) considered CEO retention/replacement as consequence of integration processes, considering it as dependent variable. Looking at the research developed by Cardarelli and De Salzar (2019), it emerges that they adopted the CEO replacement as independent variable. Starting from this and reviewing some aspects, CEO retention is used as independent variable to evaluate its impact on the post-acquisition innovative performance of target inventors. We examined the binary variable "individual retention" (i.e., ind_ret). The variable is equal to 1 if the CEO of the target firm remains within the company in a one-year window after acquisition, 0 otherwise.

6.3.3 Moderators

The moderation analysis allows to understand better how a third variable intervene in the relation between dependent and independent variables: if the intensity of the effect of X (independent variables) on Y (dependent variable) changes as values of a variable M (third variable), M can be defined moderator of the effect of X on Y and this effect is conditional to M's values.

We are interested in analysing the moderation generated by: Founder-CEOs, CEO Tenure and Duality.

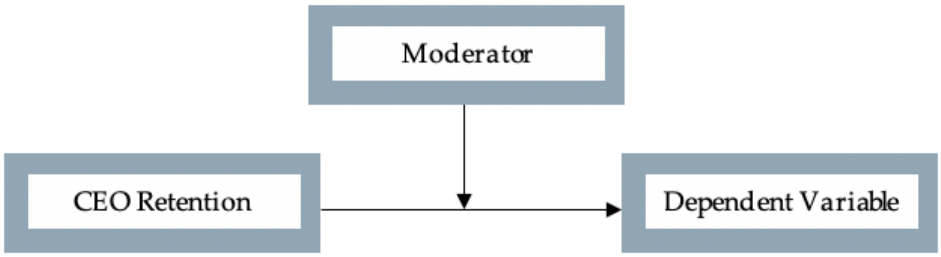


Figure 8 - Moderator's effect

- **Founder CEO**

  The presence of founder-CEOs at the helm of high-tech companies is quite common due to the "technological" elements or the entrepreneurial approach needed. As mentioned in previous chapters, many evidences demonstrate that founder-CEOs, owning firm-specific human capital, have greater acquisition implementation abilities (e.g., Aghasi et al, 2021). Founder status allows to realize better mobilizing and mitigating actions; thus, we develop such moderator variable in order to o observe whether the founder status impacts on the relation between CEO retention and several dependent variables. It is a binary variable that assumes value 1 if the target CEO is the founder of the company, 0 otherwise.

- **CEO Tenure**

  The variable can be defined as the CEO's length of time as the target firm's CEO. It is computed as the number of years which passed between the announcement year of the acquisition and the year in which the CEO became such.

  Tenure in the office can bring organizational "simplicity" and more selective attention to phenomena occurring in an organization (Walters, Kroll & Wright, 2007), leading to perform better mobilizing and mitigating actions. Moreover, some

evidence showed that greater inventions related to stable technologies are spurred by long-tenure CEOs (Wu, Levitas & Priem, 2005). On the contrary, CEOs with few years of experience are fertile ground to better benefit from acquisitions, gaining new knowledges and overcoming obstacles derived by the transaction (Hayward, 2002). Starting from these opposite views, we considered CEO tenure as moderator to assess whether it affects the relation between CEO retention and inventors' performance.

- **CEO Duality**

  As mentioned in previous chapters, CEO duality occurs whenever the CEO works even as Chairman of the Board of Directors. The effect of this condition on firms' performance was deeply studied in the academic literature: overpowering the CEO by giving her both executive's and shareholders' rights, could cause lower control and generate self-serving behaviours leading to a worsening of the principal-agency problem. In this research we want to analyse the moderating effect generated by CEO duality with respect to the relationship between the dependent and the independent variable.

6.3.4 Control Variables

In our regression model we concern about three different level: CEO, Inventor, Firm.

- **The CEO level** was considered in order to take into account impacts of the CEO's characteristics on inventors' productivity; the exact variables are founder, CEO tenure, CEO duality and gender. The first three were presented in the previous sub-section (6.3.3), since they are considered as moderators, while the latter will be presented below.
- **The inventor level** was analysed in order to directly account for changes in an inventor's productivity during the period of employment. In doing so, five control variables was entered: number of patents, patents breadth, patents quality, male and inventor tenure.
- **The firm level** was studied in order to include main aspects related to target firms, through seven variables: VC-backed, age, target listed, target size, relative size, acquirer experience and technology relatedness.

1. **Gender**

   This variable simply accounts whether the inventor is "male" or "female". Within the model, we generate "female CEO" binary variable which assumes value equal to 1 whenever the CEO is female, 0 otherwise.

2. **Inventor Tenure**

   The tenure of the inventor allows to take into account changes in an inventor's productivity during the period of employment by a target firm. It is the number of years between the date the inventor filed the first patent with the target company and the year of completion of the acquisition. Once computed, it was transformed in natural logarithmic form.

3. **Male Inventor**

   This binary variable simply considers the gender of the inventors; it assumes 1 if the inventor is male and 0 otherwise.

4. **Number of patents per inventor - pre-acquisition**

   To trace pre-acquisition productivity of inventors, we checked the number of patents assigned to each inventor 5 years before the acquisition. The time window considered is the same of Ahuja and Katila (2001) and it derives by the fact that technological knowledge depreciates rapidly and loses most of its value within that time **(**Griliches, 1979).

5. **Inventor breadth of the patent – pre-acquisition**

   It accounts for the average breadth of patents generated by the inventor in five-years window before the acquisition.

6. **Quality index (4) - pre-acquisition**

   This control variable refers to the quality index 4; it is computed making the average quality of patents generated by the inventor in a time window of five years before the acquisition.

7. **Target VC Backed**

   This is a binomial variable equal to 1 if the target is VC backed before the acquisition, 0 otherwise

8. Target Age

The variable reports the age of the target company, in years, at the time of acquisition. It is computed as difference between the acquisition year and the foundation of the company.

9. Target Size

The size of the company can be computed either in terms of employees or of inventors. We adopted the first measure.

10. Target Listed

It is a dummy variable equal to 1 if the target company was listed before the acquisition, 0 otherwise.

11. Relative Size

This variable needs to be considered as it can influence the tendency of the target firm to patenting and acquiring firm propensity toward structural integration or separation. The higher the target firm's size, the higher is the likelihood it requires more post-acquisition autonomy (Ranft & Lord, 2002). On the other hand, as size decreases, integration tends to be more complete because the acquiring firm can exercise greater influence due to superior power in decision-making (Pablo, 1994). According to Kapoor and Lim (2007), the variable was computed by dividing the number of acquired firm's inventors by the number of acquiring firm's inventors in the year of acquisition.

12. **Technological relatedness**

This dimension represents the proximity measure introduced to the patent literature by Jaffe (1986). It describes the extent to which two firms develop technology in the same classes. International Patent Classification (IPC) allows to define the distribution of the targets' and acquirers' patents across different technology areas. Grimpe and Hussinger (2014) used the three-digit IPC level **(**Makri, Hitt, & Lane 2009) and generates a measure of patent stock for each three-digit IPC class. The researchers defined the variable as the angular separation of the distribution vectors of the patent class F of the acquirer j and the target company. The measure takes the value of one for any two identical technology vectors:

$$T_{ij} = \frac{F_i \cdot F_j}{\sqrt{(F_i' \cdot F_i)(F_j' \cdot F_j)}} \qquad 0 \leq T_{ij} \leq 1 \tag{6}$$

where 0 represents no relatedness of the firms' patent portfolios, whereas a value above indicates the presence of relatedness.

13. Acquirer Experience

Given a financial transaction between two parties, the experience represents the sum of all acquisitions made by the acquirer in the 5 years before to the acquisition. Generally speaking, the acquirers' prior acquisitive experience has potentially beneficial effects: it may increase the acquirers' tendency towards structural integration thanks to their superior capabilities in managing the integration process. Each acquisition has an identical weight equal to 1, which means having a positive integer ranging between 0 and + ∞:

$$\sum_{i=1}^{5} A_{year-i} \tag{7}$$

with A=1.

Considering the research of Aghasi et al. (2017), it suggests using this variable as a logarithmic transformation.

6.4 Model Specification

We measure the effect of CEO replacement on the innovative performance of target inventors, measured by looking at their patenting activity, in a time window that goes from -5 to +5 years respect to the acquisition completion year. We leveraged on the Ordinary Least Squares (OLS) specification, which is expressed as the following Equation (8):

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n + u \quad n = 1, \dots, 17 \tag{8}$$

Assuming:

- Mean Zero. $\mathbb{E}(u) = 0$
- Common Variance. $Var(u) = \sigma^2$
- $u \sim N(0, \sigma^2)$

In doing so, we are assuming that a set of explanatory variables, belonged to the vector X, can explain the impact of innovative performance. While the set of coefficients β report how changes on X have impacts on Y. The coefficient u is the residual error and contains all the other factors affecting Y, except X.

6.4.1 Models

In order to test the hypothesis formulated in chapter V, we developed twelve different models, according to dependent and independent variables. We used the Tobit model in case of Change in Inventor Productivity since it results to be a better estimator when the variable is a count data. Then, we leveraged on the Ordinary Least Squares (OLS) model when dealing with the other two dependent variables (i.e., Change in Inventor Breadth, Change in Patent Quality). All models have all the control variables, which are the following:

1. **Model I (Tobit)**: the dependent variable is the *Change in Inventor Productivity*, the independent variable is the *CEO Retention*
    - CEO retention within 1 year
    - Founder
    - CEO Tenure
    - Duality
    - Gender
    - Tenure Inventor (Log)
    - Male Inventor
    - Nr Patent Inventor (Pre-acquisition)
    - Patent Breadth Inventor (Pre-acquisition)
    - Quality 4 Index Patent (Pre-acquisition)
    - Relative Size
    - Target VC-backed
    - Target Age
    - Target Listed
    - Target Size
    - Technology Relatedness

- Acquirer Experience (Log)

2. **Model II (OLS):** the dependent variable is the *Change in Inventor Breadth,* the independent variable is the *CEO Retention*
3. **Model III (OLS): t**he dependent variable is the *Change in Patent Quality Index,* the independent variable is the *CEO Retention*
4. **Model IV** (Tobit): the dependent variable is the *Change in Inventor Productivity,* the independent variable is the *CEO Retention* with the moderating effect of the *Founder Status*
5. **Model V** (OLS): the dependent variable is the *Change in Inventor Breadth,* the independent variable is the *CEO Retention* with the moderating effect of the *Founder Status*
6. **Model VI** (OLS): the dependent variable is the *Change in Patent Quality Index,* the independent variable is the *CEO Retention* with the moderating effect of the *Founder Status*
7. **Model VII** (Tobit): the dependent variable is the *Change in Inventor Productivity,* the independent variable is the *CEO Retention* with the moderating effect of the *CEO Tenure*
8. **Model VIII** (OLS): the dependent variable is the *Change in Inventor Breadth,* the independent variable is the *CEO Retention* with the moderating effect of the *CEO Tenure*
9. **Model IX** (OLS): the dependent variable is the *Change in Patent Quality Index,* the independent variable is the *CEO Retention* with the moderating effect of the *CEO Tenure*
10. **Model X** (Tobit): the dependent variable is the *Change in Inventor Productivity,* the independent variable is the *CEO Retention* with the moderating effect of the *CEO Duality*

11. **Model XI** (OLS): the dependent variable is the *Change in Inventor Breadth,* the independent variable is the *CEO Retention* with the moderating effect of the *CEO Duality*
12. **Model XII** (OLS): the dependent variable is the *Change in Patent Quality Index,* the independent variable is the *CEO Retention* with the moderating effect of the *CEO Duality*

7. Empirical Results

7.1 Descriptive Statistics and Correlation Analysis

		Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1.	Change Productivity	-2.065	11.814	1.00																			
2.	Change Quality 4 Index	-11.019	16.354	0.08	1.00																		
3.	Change Patent Breadth	-1.443	2.473	0.17	0.18	1.00																	
4.	CEO Retention	0.580	0.494	0.18	0.10	0.20	1.00																
5.	Founder	0.324	0.468	-0.08	0.00	-0.07	0.11	1.00															
6.	Tenure CEO	5.494	5.742	-0.06	0.07	0.04	0.07	0.56	1.00														
7.	CEO Duality	0.125	0.330	0.03	0.06	-0.14	-0.41	0.16	0.05	1.00													
8.	Female (CEO)	0.042	0.200	0.02	-0.01	-0.04	0.09	-0.00	-0.06	-0.08	1.00												
9.	Target Size	220.991	139.211	-0.02	0.02	0.08	0.19	0.13	0.26	-0.00	0.15	1.00											
10.	Target VC-backed	0.291	0.454	0.06	-0.07	0.01	0.10	-0.04	-0.09	-0.20	0.21	-0.04	1.00										
11.	Target Listed	0.708	0.455	0.03	0.00	0.02	-0.02	-0.25	-0.10	-0.21	0.06	0.38	-0.03	1.00									
12.	Target Age	15.303	9.976	-0.06	0.13	-0.02	0.00	-0.22	0.18	0.04	-0.06	0.34	-0.25	0.12	1.00								
13.	Technology Relatedness	0.631	0.314	0.07	0.06	-0.01	-0.05	0.04	-0.01	0.17	-0.05	-0.09	-0.13	-0.15	-0.30	1.00							
14.	Acquirer Experience	2.163	0.914	0.08	-0.10	0.03	-0.18	0.20	0.11	0.02	-0.23	-0.13	-0.02	-0.11	-0.25	0.23	1.00						
15.	Tenure Inventor	1.491	0.609	-0.22	-0.08	-0.02	-0.07	0.01	0.10	-0.08	0.05	0.04	-0.05	0.04	0.10	-0.04	0.04	1.00					
16.	Relative Size	0.981	3.447	0.08	0.01	0.05	0.18	-0.14	-0.13	-0.08	-0.05	0.05	-0.14	0.11	-0.01	0.16	0.08	-0.18	1.00				
17.	Male (inventor)	0.887	0.317	-0.02	-0.01	0.04	0.05	-0.02	-0.06	-0.01	-0.02	0.02	-0.05	0.00	0.03	-0.06	-0.04	0.05	0.04	1.00			
18.	Quality 4 Index Patent (pre)	21.474	13.330	0.01	-0.66	0.06	-0.05	-0.02	-0.09	-0.02	0.03	-0.04	0.11	0.04	-0.25	0.04	0.07	0.06	0.01	0.03	1.00		
19.	Nr of Patent Inventor (pre)	4.933	9.949	-0.81	0.06	-0.02	-0.16	0.09	0.08	-0.01	-0.00	0.04	-0.08	-0.04	0.04	0.00	-0.06	0.27	-0.06	0.05	0.01	1.00	
20.	Patent Breadth Inventor (pre)	2.566	2.027	-0.09	0.06	-0.79	-0.19	0.12	0.02	0.20	0.05	-0.11	0.02	0.01	0.02	0.02	-0.08	0.04	-0.11	-0.08	-0.06	0.06	1.00

Table 1 - Descriptive statistics and Correlation matrix

Table 1 provides an overall picture regarding statistics and correlations, for the variables used in the analysis. Starting from dependent variables (change in productivity, quality index and inventor breadth), in conjunction with inventor-control variables, it can be easily understood that the sample of 964 active inventors suffered a drop in the innovative performance.

As reported by the descriptive statistic, the inventor productivity on average decreases by -2.1 patents per inventor. In percentage, the patenting productivity reduces by 41.86%, considering that the average number of patents generated by each inventor before the acquisition is 4.9. Looking at the quality variations, the quality index dropped by 51.31%, passing from 21.5 to 10.5.

Shifting to patent breadth, the diversity of the overarching technological domains underlying the inventing claims of a patent suffered a decline by almost 56.24%, since the variable moves from 2.6 to 1.1, in the post–acquisition period.

Starting with variables related to the firm, the relative size is high and stays around 98%; as we reported all over the dissertation, the sample of target firms is characterized by high-tech companies mainly acquired to obtain their tacit knowledge, and since inventors are the principal source of innovation, it can be reasonable to have a number of inventors quite similar to the one in the acquirer, despite target firms are composed by less than 500 employees. Technology relatedness among target and acquirer stays around 63%, while listed target firms are about 71%.
To conclude, the percentage of founder-CEOs is about 32%, while the sample of top executive managers that is also chairman equals 12.5%; then, CEOs tenure is almost 6years, meaning that tenure office of CEOs is on average 6 years from the announcement of the acquisition.
Observing the independent variable, it results that in 58% of cases the CEO was retained by the acquiring firm.

The correlation matrix reveals that the highest relationship among variables is the one between the tenure of CEOs and the founder status, which is almost equal 0.56. Even though it is not always true the positive effect between the two variables, the value of the correlation is quite intuitive. CEOs that have the highest tenure are those that have more experience and spent more time as such since announcement year; at the same time, founders are those that found the company, becoming CEO immediately or later. Therefore, it is rationale that in our case the longer the tenure, the higher the likelihood that the CEO results to be even founder of the target firm. In addition, CEO duality

results negatively correlated to our independent variable, with a value of -0.41. This value is somehow expected since, as mentioned in previous chapters, whenever the CEO is also the chairman of the company, the entrenchment problem arises, generating difficulties in controlling and monitoring CEO's activities. It is interesting to note the negative relationship between the age of the target firm and the patent quality index (-0.25), meaning that the younger target company, the higher the quality of patents generated by its inventors: younger company are those closer to the start-up structure and hence more flexible, with higher technological content and incline to introduce new innovations with respect to well-established firms. On the contrary, a positive correlation characterizes the age of target firms and the target size: as the age of the target company increases, its size increases too. Dealing with small high-tech companies, even in this case the example of start-ups' structures motivates the correlation: start-ups have usually small size and lean structure, characterizing their first years of life. As time goes by, one possible scenario is the development and the evolution of the start-up toward more stable and less dynamic structure, which implies the increment in the number of employees (i.e., the size).

Considering the target size, it can be seen that the variable has a positive correlation with the possibility of being listed or not (0.38). Listed companies are usually developed and experienced, thus their size matters. Furthermore, the relation between the acquirer experience and technology relatedness is quite high (0.23); indeed, the accumulated experience of acquirers in previous acquisitions let the likelihood to have technology overlap (firms with similar technological base) increase. Inventor tenure and number of patent inventor are correlated by a factor of 0.27: it is well-founded that as the tenure of the inventor increases, the number of patents realized by him increases too.

Finally, it is relevant to highlight the low correlation between the quality of patents and the number of patents (1%), which supports our approach in using quality measures to assess inventors' performances and to identify high and low performing indicators. Indeed, quantitative and quality patent variables are mutually exclusive and capture independent angles of performance of inventors.

7.2 Multivariate results

In this section, we will report results obtained from our analysis to support the hypothesis. Given that control variables are the same for each dependent variable, we illustrate our estimations starting from the four hypothesis and then analysing each variable for each model. Moreover, numbers reveal that the model which generally explains most of variations in innovative performance is the one which considers Change in Breadth as dependent variable, since the R-Squared has the highest percentage (59%).

Hypothesis 1

VARIABLES	Model I	Model II	Model III
CEO Retention	2.070***	4.620***	0.508***
	(0.594)	(0.966)	(0.114)
Founder CEO	-0.131	-0.862	0.226
	(0.657)	(1.275)	(0.157)
Tenure CEO	0.0553	0.253***	0.00958
	(0.0501)	(0.0965)	(0.0119)
CEO duality	3.595**	8.544***	1.149***
	(1.493)	(1.605)	(0.289)
Female (CEO)	1.274	0.557	-0.0325
	(0.872)	(2.016)	(0.236)
Target Size	-0.00165	-0.00731**	-0.00137***
	(0.00189)	(0.00367)	(0.000444)
Target VC - backed	0.211	1.257	0.128
	(0.541)	(1.131)	(0.109)
Target Listed	1.471**	5.241***	0.750***
	(0.600)	(1.116)	(0.127)
Target Age	-0.0161	-0.0565	-0.00479
	(0.0313)	(0.0578)	(0.00665)
Technology Relatedness	2.181***	3.400**	0.0687
	(0.801)	(1.626)	(0.167)
Acquirer Experience (log)	0.497	-0.798	-0.0657
	(0.338)	(0.505)	(0.0564)
Tenure Inventor (log)	0.133	-1.369*	-0.0489
	(0.340)	(0.765)	(0.0865)
Relative Size (inventor)	0.0419	0.0142	-0.0201*
	(0.121)	(0.161)	(0.0113)
Male (inventor)	1.046**	0.588	-0.0967
	(0.462)	(1.269)	(0.173)
Quality 4 Index Patent (pre)	0.0109	-0.819***	0.00339
	(0.0151)	(0.0469)	(0.00325)
Nr Patent Inventor (pre)	-0.935***	0.183***	0.0112**
	(0.0243)	(0.0417)	(0.00549)
Patent Breadth Inventor (pre)	-0.128	0.0791	-0.954***
	(0.108)	(0.236)	(0.0310)
Constant	-3.234**	0.0194	0.420
	(1.644)	(3.074)	(0.338)
Observations	874	874	874
Log Likelihood	-2956	-3426	-1540
R2	0.1440	0.474	0.593

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 2 - Results coming from Hypothesis 1

The table clearly shows that the majority of coefficients are statistically significant (at least in one of the three models), in particular the independent variable validates our assumption: **CEO retention results have a positive impact on post-acquisition innovative performance of inventors.** For all the models, the coefficients are positive and significant with a p-value lower than 1%: as the CEO is retained by the acquiring firm, there is a higher probability that the innovative level of target inventors raises after the transaction, fully consistent with our first hypothesis.

In chapter IV, we argued that to preserve the complex and path-dependent knowledge, acquiring firms should retain the target CEO, pursuing an implementation strategy that lets the level of autonomy increase. Indeed, top executives, through their management capabilities, are able to mitigate the disruptive effect over inventors and the consequence of autonomy loss, which could be emerged after the acquisition. CEO retention means gaining a facilitator for the integration process which reduces the cultural shock that could affect inventors.

Noteworthy, a high significance is also found in target listed and number of patents prior to the acquisition**.** The former refers to the binomial variable which appears positive and significant at 5% in the first model and at 1% in the subsequent ones. Therefore, numbers reveal that in case of listed target firms, downward the acquisition, a positive variation in quality indicators and patent count is recorded. For the second variable, the relation is negative in model I (p-value < 1%), while it becomes positive in the other models (p < 1% and p < 5%, respectively in model II and III). These values suggest that as the number of patents increases, the possibility to observe a reduction in the productivity of inventors grows; whereas, moving toward quality changes, the relationship inverts: if patents prior to the acquisition increases by one, this generates an increase in the quality index by 0.183 and in patent breadth by 0.0112.

Hypothesis2

VARIABLES	Model IV	Model V	Model VI
CEO Retention	1.375*	3.502***	0.386***
	(0.761)	(1.186)	(0.137)
Founder	-2.059***	-3.959**	-0.113
	(0.773)	(1.749)	(0.236)
Founder#CEO Retention	2.578**	4.142**	0.453*
	(1.103)	(1.928)	(0.248)
Tenure CEO	0.0610	0.262***	0.0106
	(0.0511)	(0.0998)	(0.0119)
CEO duality	3.246**	7.984***	1.088***
	(1.506)	(1.615)	(0.287)
Female (CEO)	1.233	0.491	-0.0397
	(0.851)	(1.990)	(0.237)
Target Size	-0.00112	-0.00646*	-0.00128***
	(0.00192)	(0.00375)	(0.000448)
Target VC - backed	0.295	1.393	0.142
	(0.555)	(1.133)	(0.108)
Target Listed	1.196*	4.799***	0.701***
	(0.643)	(1.146)	(0.131)
Target Age	-0.0144	-0.0538	-0.00449
	(0.0313)	(0.0576)	(0.00665)
Technology Relatedness	2.284***	3.565**	0.0868
	(0.804)	(1.612)	(0.167)
Acquirer Experience (log)	0.417	-0.926*	-0.0797
	(0.343)	(0.502)	(0.0576)
Tenure Inventor (log)	0.0192	-1.552**	-0.0689
	(0.346)	(0.777)	(0.0881)
Relative Size (inventor)	0.0601	0.0435	-0.0169
	(0.123)	(0.163)	(0.0114)
Male (inventor)	1.166**	0.781	-0.0755
	(0.474)	(1.268)	(0.173)
Quality 4 Index Patent (pre)	0.00828	-0.823***	0.00292
	(0.0150)	(0.0471)	(0.00327)
Nr Patent Inventor (pre)	-0.926***	0.198***	0.0128**
	(0.0248)	(0.0416)	(0.00554)
Patent Breadth Inventor (pre)	-0.148	0.0473	-0.957***
	(0.109)	(0.237)	(0.0311)
Constant	-2.576	1.076	0.535
	(1.669)	(3.171)	(0.354)
Observations	874	874	874
Log likelihood	-2954	-3425	-1539
R2	0.1446	0.476	0.595

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3 - Results coming from Hypothesis 2

Hypothesis two examines the moderating effect of the founder status over the CEO retention variable. Looking at the above table, it is easy to catch that several control variables result significant and, further, our independent variable with the moderation of founder status is positively related to the change in the innovative performance of

inventors. This happens in all the models with a significance level which decreases just in the last one ($p < 10\%$). As expected, the moderation of founder status strengthens the positive relation between CEO retention and the dependent variables. Moreover, we look at the margins to get the conditional effect; when the CEO is the founder, the coefficient is positive and higher than the case of a non-founder-CEO, especially for model V (in case of founder-CEO, the coefficient is equal to 7.64, against 3.5, with a p-value equals to 0).

	dx/dy	Delta-method Std.Err.	t	P>|t|	[95% Conf.Interval]	
0. CEO Retention	(base outcome)					
1.CEO Retention at:						
1	3.50	1.19	2.95	0.00	1.17	5.82
2	7.64	1.54	4.96	0.00	4.62	10.67

Table 4 - Margins of Model V, Hypothesis 2

	dx/dy	Delta-method Std.Err.	t	P>|t|	[95% Conf.Interval]	
0. CEO Retention	(base outcome)					
1.CEO Retention at:						
1	1.37	0.76	1.81	0.07	-0.12	2.87
2	3.95	0.80	4.97	0.00	2.39	5.51

Table 5 - Margins of Model IV, Hypothesis 2

	dx/dy	Delta-method Std.Err.	t	P>|t|	[95% Conf.Interval]	
0. CEO Retention	(base outcome)					
1.CEO Retention at:						
1	0.39	0.14	2.81	0.00	0.12	0.65
2	0.84	0.21	4.09	0.00	0.44	1.24

Table 6 -Margins of Model VI, Hypothesis 2

Hypothesis 3

VARIABLES	Model VII	Model VIII	Model IX
CEO Retention	2.406***	2.273	0.273
	(0.895)	(1.556)	(0.181)
Founder	-0.145	-0.769	0.235
	(0.666)	(1.281)	(0.157)
Tenure CEO	0.106	-0.102	-0.0259
	(0.118)	(0.164)	(0.0223)
Tenure CEO#CEO Retention	-0.0640	0.448**	0.0447*
	(0.116)	(0.186)	(0.0240)
CEO duality	3.618**	8.384***	1.133***
	(1.502)	(1.636)	(0.287)
Female (CEO)	1.307	0.330	-0.0552
	(0.875)	(1.989)	(0.237)
Target Size	-0.00195	-0.00521	-0.00116**
	(0.00204)	(0.00389)	(0.000454)
Target VC - backed	0.196	1.359	0.138
	(0.548)	(1.129)	(0.109)
Target Listed	1.513**	4.948***	0.720***
	(0.632)	(1.131)	(0.130)
Target Age	-0.0124	-0.0822	-0.00736
	(0.0309)	(0.0602)	(0.00672)
Technology Relatedness	2.230***	3.057*	0.0345
	(0.806)	(1.664)	(0.169)
Acquirer Experience (log)	0.501	-0.828	-0.0687
	(0.338)	(0.503)	(0.0568)
Tenure Inventor (log)	0.153	-1.510*	-0.0630
	(0.350)	(0.772)	(0.0873)
Relative Size (inventor)	0.0376	0.0441	-0.0171
	(0.123)	(0.163)	(0.0115)
Male (inventor)	1.017**	0.787	-0.0768
	(0.461)	(1.270)	(0.172)
Quality 4 Index Patent (pre)	0.0112	-0.821***	0.00317
	(0.0151)	(0.0474)	(0.00328)
Nr Patent Inventor (pre)	-0.937***	0.199***	0.0128**
	(0.0250)	(0.0416)	(0.00556)
Patent Breadth Inventor (pre)	-0.122	0.0400	-0.958***
	(0.108)	(0.236)	(0.0311)
Constant	-3.548**	2.216	0.639*
	(1.782)	(3.313)	(0.377)
Observations	874	874	874
Log likelihood	-2956	-3424	-1539
R2	0.1441	0.476	0.595

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 7 - Results coming from Hypothesis 3

Our third hypothesis focused on the moderating effect generated by the CEO tenure on the relation between CEO retention and each dependent variable. Results are consistent with the announced hypothesis, however not all values are significant. The interaction variable is negative and not significant in model VII, while moving toward the other two the relation becomes positive and the significance increases ($p < 1\%$ and

p<5%, respectively in model VIII and model IX). Looking at margins (tables 9, 10), we cannot say anything about the CEO retention without moderating effect of the CEO.

	dx/dy	Delta-method Std.Err.	t	P>|t|	[95% Conf.Interval]	
0. CEO Retention	(base outcome)					
1.CEO Retention at:						
1	2.41	0.9	2.69	0.01	0.65	4.16
2	2.34	0.81	2.89	0.00	0.75	3.93

Table 8 - Margins of Model VII, Hypothesis 3

	dx/dy	Delta-method Std.Err.	t	P>|t|	[95% Conf.Interval]	
0. CEO Retention	(base outcome)					
1.CEO Retention at:						
1	2.27	1.56	1.46	0.145	-0.78	5.33
2	2.72	1.41	1.93	0.054	-0.05	5.49

Table 9 - Margins of Model VIII, Hypothesis 3

	dx/dy	Delta-method Std.Err.	t	P>|t|	[95% Conf.Interval]	
0.CEO Retention	(base outcome)					
1.CEO Retention at:						
1	0.27	0.18	1.51	0.13	-0.08	0.63
2	0.32	0.16	1.96	0.05	-0.00	0.64

Table 10 - Margins of Model IX, Hypothesis 3

Hypothesis 4

VARIABLES	Model X	Model XI	Model XII
CEO Retention	2.111***	4.674***	0.522***
	(0.596)	(0.970)	(0.114)
Founder	-0.0809	-0.795	0.243
	(0.654)	(1.280)	(0.157)
Tenure CEO	0.0540	0.251***	0.00915
	(0.0499)	(0.0964)	(0.0119)
CEO Duality	3.741**	8.739***	1.199***
	(1.510)	(1.615)	(0.291)
CEO Duality#CEO Retention	-7.245***	-9.681***	-2.479***
	(1.420)	(2.065)	(0.351)
Female (CEO)	1.270	0.551	-0.0341
	(0.871)	(2.018)	(0.236)
Target VC - backed	0.208	1.254	0.127
	(0.541)	(1.133)	(0.109)
Target Listed	1.495**	5.272***	0.758***
	(0.601)	(1.119)	(0.127)
Target Age	-0.0163	-0.0569	-0.00488
	(0.0313)	(0.0579)	(0.00665)
Target Size	-0.00178	-0.00749**	-0.00142***
	(0.00189)	(0.00369)	(0.000446)
Technology Relatedness	2.192***	3.415**	0.0725
	(0.801)	(1.627)	(0.167)
Acquirer Experience (log)	0.490	-0.807	-0.0679
	(0.338)	(0.506)	(0.0565)
Tenure Inventor (log)	0.131	-1.373*	-0.0498
	(0.341)	(0.766)	(0.0867)
Relative Size (inventor)	0.0413	0.0134	-0.0203*
	(0.121)	(0.161)	(0.0113)
Male (inventor)	1.058**	0.605	-0.0923
	(0.463)	(1.271)	(0.173)
Quality 4 Index Patent (pre)	0.0115	-0.818***	0.00357
	(0.0151)	(0.0470)	(0.00326)
Nr Patent Inventor (pre)	-0.935***	0.183***	0.0112**
	(0.0243)	(0.0416)	(0.00547)
Patent Breadth Inventor (pre)	-0.131	0.0756	-0.955***
	(0.108)	(0.237)	(0.0310)
Constant	-3.257**	-0.0105	0.412
	(1.645)	(3.077)	(0.338)
Observations	874	874	874
Log likelihood	-2956	-3426	-1539
R2	0.1442	0.474	0.595

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 11 - Results coming from Hypothesis 4

Finally, hypothesis 4 stated the negative moderating effect of the CEO duality over the dependent variables. This is confirmed by a negative relationship which keeps its significance at $p < 1\%$, in each model. Even looking at margins, all three models reveal a significant negative value (see Table 12, 13, 14). Therefore, in line with extant

literature, CEO duality leads to have overpowered CEOs and principal-agent problems, which negatively affect the innovative performance of inventors after the acquisition.

	dx/dy	Delta-method Std.Err.	t	P>|t|	[95% Conf.Interval]	
0. CEO Retention	(base outcome)					
1.CEO Retention at:						
1	2.11	0.60	3.54	0.00	0.94	3.28
2	-5.13	1.35	-3.81	0.00	-7.78	-2.49

Table 12 – Margins of Model X, Hypothesis 4

	dx/dy	Delta-method Std.Err.	t	P>|t|	[95% Conf.Interval]	
0. CEO Retention	(base outcome)					
1.CEO Retention at:						
1	4.67	0.97	4.82	0.00	2.77	6.58
2	-5.01	1.87	-2.67	0.01	-8.68	-1.33

Table 13 - Margins of Model XI, Hypothesis 4

	dx/dy	Delta-method Std.Err.	t	P>|t|	[95% Conf.Interval]	
0. CEO Retention	(base outcome)					
1.CEO Retention at:						
1	0.52	0.11	4.58	0.00	0.30	0.75
2	-1.96	0.33	-5.91	0.00	-2.61	-1.31

Table 14 - Margins of Model XII, Hypothesis 4

Part III – CONCLUSIONS

8. Conclusions

8.1 Discussion and Conclusions

The research contributes to the evolution of studies on post-acquisition performances, focusing on variables that affect the inventors' productivity in the aftermath of acquisitions. Our dissertation demonstrates that **ex-post decisions-making can highly influence the success of an acquisition, to the extent of determining its failure**. In particular, we considered a large sample of small high-tech firms, both privately held and public, based in the USA and acquired by large firms, between 2001 and 2015. We found that target inventors' performance is positively correlated to the decision of retaining the target CEO and, whenever the target CEO coincides with the founder this relation is better off. Moreover, since the tenure of the CEO represents her expertise, CEO tenure results to be a moderator which ameliorates the relation. Finally, as expected, a negative moderation derives from CEO duality, due to crucial issues coming from overpowered CEOs and entrenchment.

In investigating what mentioned, the research follows the path started by Graebner et al. (2010), according to which in technology-driven acquisitions involving small target firms, the implementation phase remains a substantial challenge: **the CEO retention/replacement is a crucial dimension and a choice to be taken for effectively implementing the transaction** (Aghasi, et al., 2017; Cannella & Hambrick, 1993).

Eventually, the dissertation applies the lens of KBV and RBV, combined with insights from the literature on acquisition implementation.

In general, existent research explored key decisions leading to post-acquisition implementation success but considering firm results. In our dissertation we highlight the fact that the fine-grained level of analysis is worth to be explored (i.e. inventor level).

Literature regarding CEO retention/replacement of the acquired entity can be schematized in two main streams: the first one regards **the definition of determinants that drive the decision of retaining the target CEO.** This stream has been widely examined, representing CEO retention as a direct consequence of the implementation strategy (Aghasi et al., 2017) or as a key determinant of success. The second stream is related to **the evaluation of possible effects generated by CEO retention.** Cannella and Hambrick (1993) and Krishnan et al. (1997) investigated the change in performances following CEO departure, revealing a negative relationship with respect to firms' performances. Aside accounting data suggesting the performance, we found complementary results at individual inventor level as well.

We contribute to this second stream of research by directly linking the performance of single inventors to CEO retention. This confirms results of past studies, arguing that CEOs' departure negatively affects performances of target inventors. Going beyond this relation, we investigate about ways through which changes produced by the different type of retained target CEO impact on inventors' performances. What we achieved demonstrates that maintaining the CEO allows to lessen disruptive effects caused by technological-driven acquisitions: uncertainty spread among target employees, hierarchical disruption, and variations in control structures.

Building on the KBV, we considered the additional value brought by inventors, which allows obtaining a high level of innovative productivity. Key organization's assets lie in technological skills owned by target knowledge workers (Leonard-Barton, 1995; Kogut & Zander, 1992; Grant, 1996). As previously mentioned, Chaudhuri and Tabrizi (1999) demonstrated that high-tech acquisitions have on average higher failure rates and this can be connected to disorientation generated by the transaction (Hambrick & Cannella, 1993; Lubatkin, Schweiger & Weber,1999**;** Paruchuri et al., 2006)**.** Our goal was to show that CEO retention reduces the chances of this potential disfunction in the social and organizational context. **The target CEO can support her company in keeping a certain level of continuity, which guarantees stability to target inventors in terms of status within the combined entity.** This factor is considered crucial by Paruchuri et al. (2006) in determining whether the object of the acquisition is achieved. The way through which inventors' performances are measured allows us to avoid the risk of over-evaluating the impact of complementary assets on inventors' performance: in fact, by including quantitative and qualitative measures, it is possible to get an effective benchmark of the innovative contribution coming from target inventors (e.g., it could be that target inventors reduce their production of patents but increase the quality of production downward the integration in the acquiring company). Moreover, this approach allows to overpass applicative limits related to the traditional market acquisition's valuation: when dealing with small firms' acquisitions, it can be challenging isolating the added value provided by the target firm due to share price movements in the surroundings of the deal (Cannella & Hambrick, 1993); hence, our inventor patent performance provides a better measure for these types of acquisitions. Taking on a RBV perspective, target CEOs have generic and firm-specific characteristics which makes the company unique. Indeed, the innovative performance does not derive from investment realized to hamper competitors, but rather from

owning rare resources. This leads to study determinants and likelihood of post-acquisition retention of the target CEO (Bargeron et al., 2017; Bergh, 2001; Buchholtz et al., 2003; Fich, Rice & Tran, 2016; Wulf & Singh, 2011). We shed light on the founder status, CEO tenure and duality, to analyse the moderating effects on the relation "retention-innovative performance". Following the evidence provided by Aghasi et al., (2021) on founder-CEOs, we focused on the mediating effect that this status could have on inventors' performance. **Target founder-CEOs have firm-specific human capital which makes them superior in terms of implementation abilities**. In line with what we advanced in chapter V, they neutralize, or at least reduces, employee's disorientation after the transaction thanks to their charismatic leadership.

Regarding CEO tenure, what we propose is to go beyond current studies and try to focus the attention on the connection between this CEO's characteristic and the level of production, by observing how the CEO tenure can change the relation between CEO retention and inventors' performance. The relation keeps its positivity confirming our hypothesis 3 for which **long-tenured CEOs have an intrinsic knowledge regarding the firm and its employees**, let them becoming effective facilitators of the transaction.

In chapter IV, we presented theories at the base of the CEO duality debate: stewardship theory against agency theory. Our results are not consistent with the former view and instead support the agency theory: **in case of CEO duality, the relation between CEO retention and the inventors' productivity is weakened**. As mentioned in hypothesis 4, this negative moderation implies that whenever the target CEO is also chairman of the board, conflict of interests arises and the board's effectiveness in monitoring top management reduces.

To summarize, this dissertation offers different **contributions to the literature related to the centricity of executive top managers** (Pitts 1976, Trautwein 1990): above all a

new methodology to measure acquisition success is offered, which allows defining value creation and potential synergies in highly specialized domains. The approach we followed is not limited to consider first filings but includes continuations, which permit to get a better estimation of inventors' performances, also looking upon their incremental efforts. Moreover, relying on quality indicators allows to provide a detailed analysis of inventor's patenting activity, deeper than previous studies (differently from Kapoor & Lim, 2007). Secondly, this study can be traced back to the stream of entrepreneurship literature which explores the succession of founder-CEOs; taking for granted the higher probability of retaining founder-CEOs (Aghasi et al., 2021), we connected this attribute to the productivity after the acquisition, demonstrating the positive relation. We highlight the fact that at the top of the decision of retaining or not target CEOs, there are some characteristics that make them more/less capable in supporting the entire implementation process of the acquisition, and thus strengthening/weakening the relation of retention and inventors' performance (i.e., CEO tenure and CEO duality).

8.2 Limitations

Our study has some limitations that open the possibility to new research.

Firstly, this dissertation is limited to the U.S. market, and hence, it could be interesting analysing other national contexts. In doing so, it would be essential to make appropriate considerations regarding cultures, standards and jurisdictions which could affect patent productivity.

Secondly, target companies considered here are small firms with maximum 500 employees; it could be insightful to observe acquisitions among larger firms or incumbents.

Thirdly, we did not take into account the personal educational background of target CEOs. Therefore, considering the impact of CEOs' education could give additional insights regarding the relationship between the retention decision and the level of innovation.

The fourth limitation is related to the independent variable that we considered, namely CEO retention. It could be relevant to study how the retention of the entire executive team might impact on target inventors' productivity.

Moreover, we did not make any considerations about inventors' personal relationships: many scholars underline the relevance of the social context and the inventors' personal relations as driver of individual innovative performances, at the point that the composition of teams and changes in components after the acquisition could disrupt productivity.

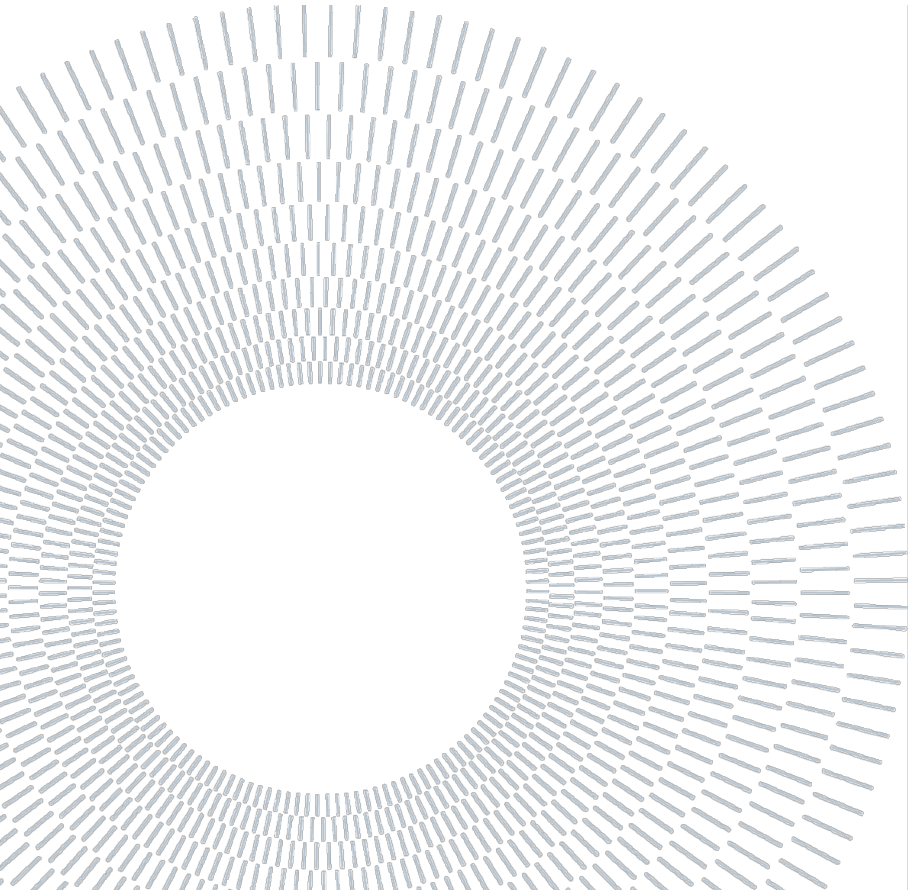
Finally, a restriction that could be relevant to overpass is linked to the usage of patent data as a measure of performance: it could be that acquiring firms prefer to express the value of acquisitions through other channels.

Future research could investigate about the technical know-how of target CEOs, adding to this research indications regarding educational background and knowledge owned by the CEO as possible impulse to the target inventors' performances.

8.3 Managerial Implications

The empirical results of this study highlight relevant aspects related to the effective implementation phase. The evidence provided is related to the target CEO's retention for the success of a high-tech acquisition: undertaking these transactions represents the opportunity to obtain new technical skills which lie outside the boundaries of the acquiring firm. Acquirers should try to bring up knowledge-sharing routines which support the transmission of information and ease inter-organization interactions. Therefore, in small high-tech acquisitions retaining the target CEO is the winning strategy: she has a crucial role since the size of the firm and works as "soft-coordinator" (Graebner, 2004), facilitating the transaction and enhancing the level of innovation of individual inventors. Moreover, we yield interesting insights about CEOs' status and characteristics as a possible boost to the target inventors' performances. The acquiring firm should be even more confident in engaging the target CEO when she results to be also the founder, thanks to her social presence within the target firm. In addition, the tenure of the target CEO allows enhancing her mobilizing and mitigating actions, alleviating the acquiring firm during the implementation phase and supporting inventors. On the contrary, when dealing with a target dual CEO, acquiring firms should perform a deeper analysis before deciding whether to retain her or not. In post-acquisition period, dual-target CEOs could exploit their high bargaining power and impose sub-optimal decisions for the company. Target CEOs are overpowered, and

this leads them to overlook inventors' psychological stability and prefer their personal interests, failing to pursue mobilizing and mitigating actions.



Annex

Annex 1. Starting Database – Merged Thompson Zephyr

Transaction_ Code	Thompson	Zephyr	Zephyr DealCode	Thompson DealNumber	Date Announced	Date Effective	Date Effective/ Unconditional	Date Withdrawn	Target Name	Target_Code	Target Nation	Target State	Target City

Acquiror Name	Acquiror Nation	Acquiror State	Acquiror City	% of Shares Acq.	% Owned After Trans-action	% sought	Status	Attitude	Value of Transaction ($mil)	Target Ticker Symbol	Significant Family Ownership of Target	Acquiror Number of Employees	Target Number of Employees

Target Total Assets One Year Prior ($ mil)	Target Total Assets Two Years Prior ($ mil)	Target Total Assets Three Years Prior ($ mil)	Target R&D One Year Prior ($ mil)	Target R&D Two Years Prior ($ mil)	Target R&D Three Years Prior ($ mil)	Target R&D Four Years Prior ($ mil)	Target R&D Five Years Prior ($ mil)	Target Ebit One Year Prior ($mil)	Host Curr. Target Ebit Two Years Prior (mil)	Target Ebit 3-Year Growth Rate (%)	Target Ebit 5-Year Growth Rate (%)	Target Ebit Five Years Prior ($mil)	Target EBITDA One Year Prior ($mil)	Target EBITDA Two Years Prior ($mil)	Target EBITDA Three Year Growth Rate	Target EBITDA Three Years Prior ($mil)	Target EBITDA Four Years Prior ($mil)	Target EBITDA Five Year Growth Rate	Target EBITDA Five Years Prior ($mil)

Target Long-Term Liab. 1-Year Prior ($ mil)	Target Long-Term Liab. 2-Years Prior ($ mil)	Target Long-Term Liab. 3-Years Prior ($ mil)	Target Long-Term Liab. 4-Years Prior ($ mil)	Target Long-Term Liab. 5-Years Prior ($ mil)	Target Total Liabili-ties 1 Year Prior ($ mil)	Target Total Liabili-ties 2 Years Prior ($ mil)	Target TotalLiabili- ties3 Years Prior ($ mil)	Target Total Lia. 5-Year Growth Rate (%)	Master Deal Type

Annex 2. Merged Patent Level

Merged Patent Level 2021		
Variables	**Definition**	**Origin**
Transaction_Code	A unique identifeir given to the transaction	Starting DB
Target_Id	A unique identifeir given to the target firm	Starting DB
Id_def_acquiror	A unique numerical identifier to the acquiring firm	Defined by us (patentsview and Patstat)
Organization	The name of the target firm given by PatentsView	Starting DB
Completion_Year	Year of completion of the acquisition	Starting DB
Inventor_Id	A unique identifier given to the inventor	Defined by us (patentsview and Patstat)
Name_First	First name of the inevntor	Defined by us (patentsview and Patstat)
Name_Last	Last name of the inventor	Defined by us (patentsview and Patstat)
Patent_ID	Patent ID	Defined by us (patentsview and Patstat)
Date_Announced	Date of patent application (filing)	Defined by us (patentsview and Patstat)
Date_Granted	Date on which the patent was granted	Defined by us (patentsview and Patstat)
Team_Size	Number of inventors that filed the patent	Defined by us (patentsview and Patstat)
IPC	Main IPC assigned to the patent	Defined by us (patentsview and Patstat)
Patent_Scope	Number of IPCs assigned to each patent	Defined by us (patentsview and Patstat)
Techn_Field_Nr	IPC-Technology Field (WIPO 2010), available at www.wipo.int/ipstats/en/statistics/technology_concordance.html	Patstat - OECD
Many_Field	Dummy: 1 if the patent belongs to more than one field, 0 otherwise	Patstat - OECD
Family_Size	Number of different offices in which the patent is protected (Martinez, 2010)	Patstat - OECD
Grant_Lag	Indicator of the number of days between application date and grant date	Patstat - OECD
Backward_Citations	Number of backward citations	Patstat - OECD
NPL_Backward_Cit	Number of Non-Patent Backward Literature citations	Patstat - OECD
Num_Claims	The number and content of the claims thus determine the breadth of the rights conferred by a patent (OECD, 2009)	Patstat - OECD
Forward_Cit_5y	Number of citations received in the 5-years after the patent pubblication (patent grant date for USPTO)	Patstat - OECD
reakthrough_Innovatio	Dummy: 1 if the patent belong to the top 1% cited patents (Ahuja and Lampert, 2001)	Patstat - OECD
Renewal	Number of years during which the patent has been kept alive, starting from application date.	Patstat - OECD
Quality_Index_4	Average of indicators: forward citations, backward citations, patent family size, number of claims - Normalized between 0 and 1	Patstat - OECD
Quality_Index_5	Average of indicators: forward citations, patent family size, number of claims, backward citations, lag index (grant lag) - Normalized betw	Patstat - OECD
Quality_Index_6	Average of indicators: forward citations, patent family size, number of calims, generality index, backward citations, lag index - Normalized between 0 and 1	Patstat - OECD

Annex 3. Merged Inventor Level

3.1 Merged Inventor Level

Merged Inventor Level 2021		
Variables	**Definition**	**Origin**
Transaction_Code	A unique identifeir given to the transaction	Defined by us
Core	Dummy: 1 if the transaction belongs to the core ones; 0 else	Patstat - OECD
Acquiring_Name	A unique identifeir given to the acquiror firm	Patstat - OECD
Target_Name	A unique identifeir given to the target firm	Patstat - OECD
Completion_Year	Year of completion of the acquisition	Patstat - OECD
Inventor_ ID	A unique identifeir given to the inventor	Defined by us
Name_First_PatentsView	First name of the inventor, as expressed on Patentsview	Patstat - OECD
Name_Last_PatentsView	Last name of the inventor, as expressed on Patentsview	Patstat - OECD
Male	Dummy: 1 if male; 0 if female	Patstat - OECD
count_of_patent_id	Number of patents generated in the time interval considered.	Defined by us
sum_of_num_claims	The number and content of the claims thus determine the breadth of the rights conferred by a patent (OECD, 2009)	Defined by us
sum_of_backward_citations	Sum of number of backward citations.	Defined by us
sum_of_forward_cit_5y	Sum of number of citations received in the 5-years after the patent pubblication (patent grant date for USPTO)	Defined by us
sum_of_npl_backward_cit	Sum of number of Non-Patent Literature citations	Defined by us
sum_of_renewal	Sum of number of years during which the patent has been kept alive, starting from application date.	Defined by us
sum_of_patent_scope	Sum of Number of IPC	Defined by us
average_of_quality_index_4	Average of indicators: forward citations, patent family size, number of claims, backward citations	Defined by us
average_of_quality_index_5	Average of indicators: forward citations, patent family size, number of claims, backward citations, lag index	Defined by us
Year_Enter	Year in which the inventor filed the first patent at the target company	Defined by us
Year_leave	Year in which the inventor filed the last patent at the target (or acquiring) company	Defined by us
count_of_patent_id_POST	Sum of number of patents generated by the target inventor inside the acquiring firm in the time interval considered	Defined by us
sum_of_num_claims_POST	The Number and content of the claims thus determine the breadth of the rights conferred by a patent (OECD, 2009), post acquisition in the acquirir	Defined by us
sum_of_backward_citations_POST	Sum of number of backward citations, post acquisition in the acquiring firm	Defined by us
sum_of_forward_cit_5y_POST	Sum of number of citations received in the 5-years after the patent pubblication (patent grant date for USPTO), post acquisition in the acquiring fir	Defined by us
sum_of_npl_backward_cit_POST	Sum of number of Non-Patent Literature citations, post acquisition in the acquiring firm	Defined by us
sum_of_renewal_POST	Sum of number of years during which the patent has been kept alive, starting from application date, post acquisition in the acquiring firm.	Defined by us
sum_of_patent_scope_POST	Sum of Number of IPC, post acquisition in the acquiring firm	Defined by us
verage_of_quality_index_4_POS	Average of indicators: forward citations, patent family size, number of claims, backward citations (post acquisition in the acquiring firm)	Defined by us
verage_of_quality_index_5_POS	Average of indicators: forward citations, patent family size, number of claims, backward citations, lag index (post acquisition in the acquiring firm	Defined by us
Linkedin URL	Linkedin profile of the inventor	Linkedin

3.2 Merged Inventor Level

tech_motive	Dummy: 1 ifthe transaction took place for a technological motive; 0 else	Defined by us - Lexis Nexis
component technology	Dummy: 1 if the transaction took place for the appropriation of the component; 0 else	Defined by us - Lexis Nexis
product	Dummy: 1 if the transaction took place for the apporpiation of the product; 0 else	Defined by us - Lexis Nexis
tar_integ	Dummy: 1 if the target company was structurally integrated withing the acquirer; 0 else	Defined by us - Lexis Nexis
gender	M if the CEO is male; F else	Defined by us - Lexis Nexis
name	First name of the CEO	Lexis Nexis
surname	Last name of the CEO	Lexis Nexis
yr_arrive	Year in which the actual CEO enetered in the company	Linkedin
yr_ceo	Year in which the actual CEO became CEO	Linkedin
yr_exit	Year in which the actual CEO exited from the company	Linkedin
ind_age_acq	Age of the CEO in the year of the acquisition	Defined by us
found	Dummy: 1 if the CEO is the founder of the target firm; 0 else	Linkedin
roles_full	All roles assumed by the CEO	Linkedin
roles	First role	Linkedin
roles_dual_1	Second role	Linkedin
roles_dual_2	Third role	Linkedin
ind_rep	Dummy: 1 if the CEO was replaced within 1 yr from the acquisition; 0 else	Defined by us
ind_rep_3	Dummy: 1 if the CEO was replaced within 3 yr from the acquisition; 0 else	Defined by us
bs	Dummy: 1 if the CEO got the Bachelor Degree; 0 else	Linkedin
bs_type	Type of Bachelor Degree	Linkedin
bs_nt	Nation of the Bachelor Degree	Linkedin
bs_type_reclass	Reclassification of Bachelor Degree's type	Defined by us
bs_uni	University of the Bachelor Degree	Linkedin
bs_nt	Nation of Bachelor Degree	Linkedin
ms	Dummy: 1 if the CEO got the Master Degree; 0 else	Linkedin
ms_type	Type of Master Degree	Linkedin
ms_type_reclass	Reclassification of Master Degree's type	Defined by us
ms_uni	University of the Master Degree	Linkedin
ms_nt	Nation of Master Degree	Linkedin
phd	Dummy: 1 if the CEO got the PhD; 0 else	Linkedin
phd_type	Type of PhD	Linkedin
phd_type_reclass	Reclassification of the PhD	Defined by us
phd_uni	University of the PhD	Linkedin
phd_nt	Nation of the PhD	Linkedin
mba	Dummy: 1 of the CEO got the MBA; 0 else	Linkedin
mba_type	Type of MBA	Linkedin
mba_uni_sec	Reclassification of the MBA	Defined by us
mba_nt_sec	Nation of the MBA	Linkedin
missing_information	Dummy: 1 if some information are missed; 0 else	Defined by us
entr_exp_sec	Dummy: 1 if the CEO was an entrepreneur before the aqcuisition; 0 else	Linkedin
entr_exp_nb_sec	Number of company founded before the acquisition	Defined by us
year_1st_job	Year in which the actual CEO got his/her first job	Linkedin
finish_uni	Year in which the CEO finished the university studies	Linkedin
work_completion	Dummy: 1 if the information about the CEO's work are complete; 0 else	Defined by us
edu_compl	Dummy: 1 if the information about the CEO's education are complete; 0 else	Defined by us
CEO_patent	Dummy: 1 if the CEO is an inventor; 0 else	Defined by us

3.3 Merged Inventor Level

inv_active	Dummy: 1 if the inventor keeps producing patents after the transaction; 0 otherwise	Defined by us
CEO_available	Dummy: 1 if at least CEO's name and last name are known; 0 otherwise	Defined by us
change_prod	Change in the innovative performance after the transaction	Defined by us
change_breadth	Change in patent breadth after the transaction	Defined by us
change_quality	Change in quality 4 index patent	Defined by us
tech_rel	Relation between the technology portfolio of target and acquiring firm - Grimpe, et Al. (2013)	Provided by Professor Keivan
acq_tot_exp	Total Experience of the acquiror in acquisitions from 1 to 5 years prior the focal one	Provided by Professor Keivan
acq_high_tech_exp	Experience of the acquiror in acquisitions in the high_tech sector from 1 to 5 years prior the focal one	Provided by Professor Keivan
tar_VCbacked	Dummy: 1 if the target company was backed by a Venture Capitalist; 0, otherwise	Provided by Professor Keivan
age	Age of the target firm	Provided by Professor Keivan
tar_listed	Dummy: 1 if the target firm is listed; 0, otherwise	Defined by us
tar_size	Nr of employees within the target company	Provided by Professor Keivan
rel_size_emp	Relative size of target firm with respect to the aquirer in terms of employees	Defined by us (patentsview and Patstat)
rel_size_inv	Relation between the number of target inventors respect the number of acquiring inventors	Defined by us (patentsview and Patstat)
ann_y	Announcement year	Provided by Professor Keivan

Annex 4. Merged Firm Level

4.1 Merged Firm Level

	MERGED FIRM LEVEL 2021	
Variables	Definition	Origin
Transaction_Code	A unique identifeir given to the transaction	Starting DB
Thompson	Dummy: 1 = transaction present in Thompson; 0 = else	Starting DB
Zephyr	Dummy: 1 = transaction present in Zephyr; 0 = else	Starting DB
Thompson DealNumber	A unique identifeir given to the transaction in the Thompson database	Starting DB
Zephyr DealCode	A unique identifeir given to the transaction in the Zaphyr database	Starting DB
announcement date	Date of announcement of the transaction	Starting DB
compl_year	Year of completion of the acquisition	Starting DB
perc_share_acq	Percentage of share	Starting DB
perc_owned_after_transaction	Percentage of share owned after the transaction	Starting DB
Acquiror_Name	The name of the acquiror	Starting DB
id_def_acq	A unique identifeir given to the acquiror	Starting DB
count inventor acquiror	Sum of acquiror inventors	Patstat - OECD
count of acquiror patent id	Sum of acquiror patents	Patstat - OECD
acquiror_state	State of the acquiror	Starting DB
acquiror_city	City of the acquiror	Starting DB
acquiror_nr_employee	Number of employees of the acquiror the closest possible to the transaction	Starting DB
sum_of_num_claims	Sum of acquiror number of claims	Patstat - OECD
sum_of_backward_citations	Sum of acquiror bacward citations	Patstat - OECD
sum_of_npl_backward_cit	Sum of acquiror NPL backward citations	Patstat - OECD
sum_of_forward_cit_5y	Sum of the acquiror forward citations	Patstat - OECD
sum_of_renewal	Sum of the acquiror renewal	Patstat - OECD
average_of_quality_index_4	Average of acquiror quality index 4 taken at inventor level (forward citations, backward citations, patent family size, number of claims)	Patstat - OECD
average_of_quality_index_5	Average of acquiror quality index 5 taken at inventor level (forward citations, backward citations, patent family size, number of claims, grant lag)	Patstat - OECD
average_of_quality_index_6	Average of acquiror quality index 6 taken at inventor level (forward citations, patent family size, number of claims, generality index, backward citations and grant lag)	Patstat - OECD

4.2 Merged Firm Level

Target_Name	The name of the target	Starting DB
id_def_targert	A unique identifier given to the target	Starting DB
Target_Inventor_Count (-5;0)	Sum of target inventors	Patstat - OECD
Target_Patent_Count (-5;0)	Sum of target patents	Patstat - OECD
Target state	State of the target	Starting DB
Target city	City of the target	Starting DB
Employee Target	Number of employees of the target the closest possible to the transaction	Starting DB
targ_sum_of_num_claims	Sum of target number of claims	Patstat - OECD
targ_sum_of_backward_citations	Sum of target bacward citations	Patstat - OECD
targ_sum_of_npl_backward_cit	Sum of target NPL backward citations	Patstat - OECD
targ_sum_of_forward_cit_5y	Sum of target forward citations	Patstat - OECD
targ_sum_of_renewal	Sum of target renewal	Patstat - OECD
targ_average_of_quality_index_4	Average of target quality index 4 taken at inventor level (forward citations, backward citations, patent family size, number of claims)	Patstat - OECD
targ_average_of_quality_index_5	Average of target quality index 5 taken at inventor level (forward citations, backward citations, patent family size, number of claims, grant lag)	Patstat - OECD
targ_average_of_quality_index_6	Average of target quality index 6 taken at inventor level (forward citations, patent family size, number of claims, generality index, backward citations and grant lag)	Patstat - OECD
IPC Acquiring (-5;0)	All acquiror IPCs assigned to each patent	Patstat - OECD
IPC Target (-5;0)	All target IPCs assigned to each patent	Patstat - OECD
acquiror_primary_sic_code	Primary SIC code of the acquiror	Patstat - OECD
All_Acquiror_SIC_Codes	All SIC codes of the acquiror (including the Primary)	Patstat - OECD
primary_Target_SIC_Code	Primary SIC code of the target	Patstat - OECD
All_Target_SIC_Codes	All SIC codes of the target (including the Primary)	Patstat - OECD
Acq_Total_EXPERIENCE	Total Experience of the acquiror in acquisitions from 1 to 5 years prior the focal one	Defined by us (patentsview and Patstat)
Acq_High_Tech_EXPERIENCE	Experience of the acquiror in acquisitions in the high_tech sector from 1 to 5 years prior the focal one	Defined by us (patentsview and Patstat)
Acq_EXPERIENCE_Similar	Experience of the acquiror in acquisitons in similar sectors from 1 to 5 years prior the focal one	Defined by us (patentsview and Patstat)
SIC_Technology_Relatedness	Relation between the technology portfolio of target and acquiring firm at SIC level - Grimpe, et Al. (2013)	Defined by us (patentsview and Patstat)
Technology_Relatedness	Relation between the technology portfolio of target and acquiring firm at IPC level - Grimpe, et Al. (2013)	Defined by us (patentsview and Patstat)
Relative Size Inv	Relation between the number of target inventors respect the number of acquiring inventors	Defined by us (patentsview and Patstat)

Appendix

Appendix 1. Patent Based Indicators

Patent Family Size

Exclusive to the Paris Convention (1883), applicants have up to 12 months from the first filing of a

patent application (typically in the country of origin) to file applications in other jurisdictions regarding the

same invention and demand the priority date of the first application. Patent Family is recognized as the set of patents field belonged to several countries which are related to each other by one or several common priority filings. The patents' value depends on the geographical scope of patent protection, which consists of the number of jurisdictions in which patent protection has been earned (Lanjouw et

al., 1998). A large amount of international patent families has been found to be valuable (Harhoff et al.,2003). By all means, applicants might agree to bear additional costs and delays of extending protection to other countries only just if they judge it is valuable.

Due to different legal procedures of offices around the world and consequent delays, indicators could suffer from timeliness. The family size used here has been normalized considering the maximum value reported by other patents in the same cohort, with cohorts that are determined by the pair technology-year.

Grant Lag

The grant lag period is defined as the time elapsed between the filing date of the application and the date of the grant. Recent evidence (Harhoff and Wagner, 2009;

Régibeau and Rockett, 2010) underlines the inverse relationship between the value of a patent and the length of the grant lag period. This literature highlights the importance of well-documenting applications: applicants try to accelerate the grant procedure for the most valuable patents by providing perfect documents and precisely following the work of the patent office. Harhoss and Waghner (2009) revealed that more controversial claims lead to slower grants, while well-documented applications are granted faster. Moreover, Régibeau and Rockett (2010) suggest that the effort coming from the filing party determines the time required to reach a granting decision; innovation cycle of the industry matters since moving to later stage the granting delay decreases and patents are approved quickly. The grant lag provided by OECD relies on patents that are arranged by year and technology field. The definition state that for each patent *p,* the grant lag index *Grant (p_i)* is:

$$Grant_{Pi} = 1 - \Delta t / Max(\Delta t_i)$$

Where:

A_t= number of days elapsing between application and granting date

Max(D) = maximum number of days it has taken any patent belonging to the same cohort *i* to be granted. In order to take under control possible examination backlogs and increasing workload, affecting certain years, the normalization of index is performed. Once the decision has been taken in the Cohort, the lag index is the highest with respect to other patents on the same cohort (by construction)

Claims

Claims define the executive rights of a patent owner since just technology or aspects covered in the claims can be legally protected. From the number and the content of claims derive the breadth of rights conferred by a patent (OECD, 2009). Moreover, the

structure of patent fees depends on the number of claims contained in the documents, hence generally the higher the number of claims and the higher the fee. It derives that the number of claims express not only the product scope of a patent but also its expected market value: the greater the number of claims, the greater the anticipated patent value (Lanjouw and Schankerman, 2001; Tong and Frame, 1994). The indicator of the number of claims per patent is normalised with respect to the maximum value of the patents in the same cohort.

Forward Citations

The technological relevance of the patent for developing subsequent technologies and for defining the economic value of inventions is represented by the number of citations held by a given patent, by definition forward citations (see Trajtenberg, 1990; Hall, et al., 2005; Harhoff et al., 2003). In order to follow guidelines for examination in the European Patent Office, references to prior art must be listed considering their relevance to the patent in question. Even if prior art can be cited as documents describing the non-infringing state of art in technology field, three types of citations exist and can be used to restrict the patentability of a patent application:

1. X citations: documents that are important when considered alone, to the extent that a claimed invention cannot be contemplated a novel
2. I citations: documents important when considered alone, to the extent that a claimed invention cannot be contemplated to involve an inventive step
3. Y citations: documents that are important if considered together with one or more documents of the same category, as such a combination would be obvious to a person skilled in the art

Forward citations are computed over a period of five or seven years after the publication date, which occurs 18 months after the filing date of the technology fields

considered. In this way, differences in citation patters should be captured. However, the 5/7 years citation lag decreases the pace of the indicator.

In line with Hall et al. (2005), computations include self-citations, meaning that they are generally more valuable than citations from external patents. Statistics are presented for the total number of citations and for citations received as X, I or Y. X-I-Y refers to references of lower technological value of the before mentioned patent. The number of forward citations can be seen as:

$$CIT_{i,T} = \sum_{t=P_i}^{P_i+T} \sum_{j \in J(t)} C_{j,i} \; ; T \leq 5 \text{ or } T \leq 7$$

Where:

$CIT_{i,j}$ = number of forward citations received by patent application *i* published in year P_i, within T years from its publication

C_i = dummy variable equals to 1 if the patent document *j* is citing patent document *i;* 0 otherwise

J(t) = set of all applications published in year *t.*

The number of forward citations must be normalised with respect to the maximum value observed in the cohort.

Generality Index

Forward patent citations can be used to assess the range of later generation of inventions benefiting from a patent by measuring the range of technology field, and industries, which mention the patent (Bresnahan and Trajtenberg, 1995). The patent generality index à la Trajtenberg et al. (1997) has been used in a variety of studies, which include several aims: identification of general purpose technology (Hall and Trajtenberg, 2004), investigation about the role of universities as sources of commercial technologies (Henderson et al., 1998), study participation and rent sharing in patent pools (Layne-Farrar and Lerner, 2011), understanding how the market of innovation

works and the way patent rights are enforced (Galasso et al., 2011). This index form is based on the modification of the Hirschman-Herfindahl Index (HHI) and relies on information concerning the number and distribution of citations received (forward citations) and the technology classes (IPC) of patents (sources of these citations). Differently from generality index's computations, here all IPC classes contained in the citing patent documents are considered, both 4-digit and n-digit IPC technology classes, where "n" represents the highest level of disaggregation possible (e.g., A61K 31/5575). Forward citations cover all categories of citations and are restricted to citations in 5-year period.

Considering X as the focal patent with Y_i patents citing the focal patent (i=1, …., N) and let β_{ji} be defined as

$$\beta_{ji} = \frac{T_{ji}^{n}}{T_{i}^{n}}$$

Where:

T_i^n = total number of IPC n-digit classes in y_i

$T_{j,i}^n$ = the total number of IPC n-digit classes in the j^{th} IPC4 digit class in y_i and j=1…

M_i is the cardinal of all IPC4-digit classes in y_i

the generality index is defined as follow:

$$G_X = 1 - \sum_{j=1}^{M_i} \left(\frac{1}{N} \sum_{i=1}^{N} \beta_{ji} \right)^2$$

Given the previous definition of beta, the generality index can be written as:

$$G_X = 1 - \sum_{j=1}^{M_i} \left(\frac{1}{N} \sum_{i=1}^{N} \frac{T_{ji}^{n}}{T_{i}^{n}} \right)^2$$

Where the denominator equal to $T_i^n * N$.

Bibliography

Abernathy, W. J., & Utterback, J. M. (1978). Patterns of industrial innovation. Technology review, 80(7), 40-47.

Accenture, Recharge Semiconductor Growth with M&A. https://www.accenture.com/us-en/insights/strategy/semiconductor-mergers-acquisitions

Agarwal, R., & Helfat, C. E. (2009). Strategic renewal of organizations. Organization Science, 20(2), 281–293.

Agbim, K. C., Zever, T. A., & Oriarewo, G.O. (2014). Assessing the effect of knowledge acquisition on competitive advantage: A knowledge-based and resource-based study. In Information and Knowledge Management (Vol. 4, No. 11, pp. 131-142).

Aghasi, K., Colombo, M. G., & Rossi-Lamastra, C. (2017). Acquisitions of small high-tech firms as a mechanism for external knowledge sourcing: The integration-autonomy dilemma. Technological Forecasting and Social Change, 120, 334-346.

Aghasi, K., Colombo, M. G., & Rossi-Lamastra, C. (2021). Post-acquisition retention of target founder-CEOs: looking beneath the surface. Journal of Management Studies.

Ahuja, G., & Katila, R. (2001). Technological acquisitions and the innovation performance of acquiring firms: A longitudinal study. Strategic management journal, 22(3), 197-220.

Ahuja, G., & Morris Lampert, C. (2001). Entrepreneurship in the large corporation: A longitudinal study of how established firms create breakthrough inventions. Strategic management journal, 22(6-7), 521-543.

Allen, T. J., & Cohen, S. (1969). Information flow in R&D laboratories. Administrative Science Quarterly, 14,12–9

Anand, J., & Singh, H. (1997). Asset redeployment, acquisitions and corporate strategy in declining industries. Strategic Management Journal, 18(S1), 99-118.

Angwin, D. N., & Meadows, M. (2015). New integration strategies for post-acquisition management. Long Range Planning, 48(4), 235-251.

Aniballi, A., & Imboccioli, M. (2020). Relatedness & experience in technology acquisitions: how they impact the performance of target inventors.

Audia, P.G., Locke, E.A., & Smith, K.G., (2000). The paradox of success: An archival and a laboratory study of strategic persistence following radical environmental change. Acad Manage J, 43(5), pp. 837-853

Bain & Company, M&A Report, 2021. https://www.bain.com/insights/rebuilding-capabilities-for-the-post-covid-19-world-m-and-a-report-2021/

Bargeron, L. L., Schlingemann, F. P., Stulz, R. M., & Zutter, C. J. (2009). Do target CEOs sell out their shareholders to keep their job in a merger? (No. w14724). National Bureau of Economic Research.

Bargeron, L. L., Schlingemann, F. P., Stulz, R. M., & Zutter, C. J. (2017). What is the shareholder wealth impact of target CEO retention in private equity deals?. Journal of Corporate Finance, 46, 186-206.

Barney, J. (1991). Special theory forum the resource-based model of the firm: origins, implications, and prospects. Journal of management, 17(1), 97-98.

Barney, J. B. (1988). Returns to bidding firms in mergers and acquisitions: Reconsidering the relatedness hypothesis. Strategic Management Journal, 9(S1), 71-78.

Barney, J. B. (1986). Strategic factor markets: Expectations, luck, and business strategy. Management science, 32(10), 1231-1241.

Baron, J. N., Hannan, M. T., & Burton, M. D. (2001). Labor pains: Change in organizational models and employee turnover in young, high-tech firms. American journal of sociology, 106(4), 960-1012.

Barton, D. L. (1995). Wellsprings of knowledge: Building and sustaining the sources of innovation. Harvard Business School.

Becker, G. S. (1993). Nobel lecture: The economic way of looking at behavior. Journal of political economy, 101(3), 385-409.

Bergh, D. D. (2001). Executive retention and acquisition outcomes: A test of opposing views on the influence of organizational tenure. Journal of management, 27(5), 603-622.

Berman, S. L., Down, J., & Hill, C. W. (2002). Tacit knowledge as a source of competitive advantage in the National Basketball Association. Academy of management Journal, 45(1), 13-31.

Birkinshaw, J., Bresman, H., & Hakanson, L. (2000). Managing the post-acquisition integration process: How the human integration and task integration processes interact to foster value creation. Journal of Management Studies,37(3), 395–425.

Boeker, W., & Fleming, B. (2010). Parent firm effects on founder turnover: Parent success, founder legitimacy, and founder tenure. Strategic Entrepreneurship Journal, 4(3), 252-267.

Bogers, M., Zobel, A. K., Afuah, A., Almirall, E., Brunswicker, S., Dahlander, L., ... & Ter Wal, A. L. (2017). The open innovation research landscape: Established perspectives and emerging themes across different levels of analysis. Industry and Innovation, 24(1), 8-40.

Brown, S. L., & Eisenhardt, K. M. (1997). The art of continuous change: Linking complexity theory and time-paced evolution in relentlessly shifting organizations. Administrative science quarterly, 1-34.

Bruner, R. F. (2002). Does M&A pay? A survey of evidence for the decision-maker. Journal of applied Finance, 12(1), 48-68.

Buchholtz, A. K., Ribbens, B. A., & Houle, I. T. (2003). The role of human capital in post-acquisition CEO departure. Academy of Management Journal, 46(4), 506-514.

Buono, A. F., Weiss, J. W., & Bowditch, J. L. (1989). Paradoxes in acquisition and merger consulting: Thoughts and recommendations. *Consultation: An International Journal*.

Burton, M. D., & Beckman, C. M. (2007). Leaving a legacy: Position imprints and successor turnover in young firms. American Sociological Review, 72(2), 239-266.

Camerer, C., & Knez, M. (1996). Coordination, organizational boundaries and fads in business practices. Industrial and Corporate Change, 5(1), 89-112.

Cannella Jr, A. A., & Hambrick, D. C. (1993). Effects of executive departures on the performance of acquired firms. Strategic Management Journal, 14(S1), 137-152.

Capron, L., Dussauge, P., & Mitchell, W. (1998). Resource redeployment following horizontal acquisitions in Europe and North America, 1988–1992. Strategic management journal, 19(7), 631-661.

Capron, L. (1999). The long-term performance of horizontal acquisitions. Strategic management journal, 20(11), 987-1018.

Capron, L., Mitchell, W., & Swaminathan, A. (2001). Asset divestiture following horizontal acquisitions: A dynamic view. Strategic management journal, 22(9), 817-844.

Cardarelli, A., & De Salazar, F. M. (2019). The Impact Of M&A Implementation on Productivity of The Acquired Inventors.

Cartwright, S., & Schoenberg, R. (2006). Thirty years of mergers and acquisitions research: Recent advances and future opportunities. British journal of management, 17(S1), S1-S5.

Cassiman, B., Colombo, M. G., Garrone, P., & Veugelers, R. (2005). The impact of M&A on the R&D process: An empirical analysis of the role of technological-and market-relatedness. research policy, 34(2), 195-220.

Castanias, R. P., C. E. Helfat. 1991. Managerial resources and rents.
J. Management 17(1) 155–171.

Chakrabarti, A. K., & Souder, W. E. (1984). Critical factors in technological innovation and their policy implications. Technovation, 2(4), 255-275.

Chaudhuri, S., & Tabrizi, B. (1999). Capturing the real value in high-tech acquisitions. Harvard business review, 77, 123-132.

Christensen, C. M., & Bower, J. L. (1996). Customer power, strategic investment, and the failure of leading firms. Strategic management journal, 17(3), 197-218.

Christensen, C. M., & Overdorf, M. (2000). Meeting the challenge of disruptive change. Harvard business review, 78(2), 66-77.

Coff, R. W. (1999). How buyers cope with uncertainty when acquiring firms in knowledge-intensive industries: Caveat emptor. Organization Science, 10(2), 144-161.

Coffee Jr, J. C. (1988). The uncertain case for takeover reform: an essay on stockholders, stakeholders and bust-ups. *Wis. L. Rev.*, 435.

Cohen, J., Krishnamoorthy, G., & Wright, A. M. (2002). Corporate governance and the audit process. Contemporary accounting research, 19(4), 573-594.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. Administrative science quarterly, 128-152.

Cohen, W. M., Nelson, R., & Walsh, J. P. (2000). Protecting their intellectual assets: Appropriability conditions and why US manufacturing firms patent (or not).

Clark, H. (1996). Using language. Cambridge University Press.

Cloodt, M., Hagedoorn, J., & Van Kranenburg, H. (2006). Mergers and acquisitions: Their effect on the innovative performance of companies in high-tech industries. Research policy, 35(5), 642-654.

Dalziel, M. (2008). The seller's perspective on acquisition success: Empirical evidence from the communications equipment industry. Journal of Engineering and Technology Management, 25(3), 168-183.

Dalton, D. R., Daily, C. M., Ellstrand, A. E., & Johnson, J. L. (1998). Meta-analytic reviews of board composition, leadership structure, and financial performance. Strategic management journal, 19(3), 269-290.

Dalton, D. R., Hitt, M. A., Certo, S. T., & Dalton, C. M. (2007). The fundamental agency problem and its mitigation. *Academy of Management annals*, *1*(1), 1-64.

Datta, D., & Grant, J. (1990). Relationships between type of acquisition, the autonomy given to the acquired firm and acquisition success: an empirical analysis. J. Manag. 13 (1), 29–44.

Datta, D. K. (1991). Organizational fit and acquisition performance: Effects of post-acquisition integration. Strategic management journal, 12(4), 281-297.

Datta, D. K., Pinches, G. E., & Narayanan, V. K. (1992). Factors influencing wealth creation from mergers and acquisitions: A meta-analysis. Strategic management journal, 13(1), 67-84.

Davis, G. F., & Stout, S. K. (1992). Organization theory and the market for corporate control: A dynamic analysis of the characteristics of large takeover targets, 1980-1990. Administrative Science Quarterly, 605-633.

Dobrev, S. D., & Barnett, W. P. (2005). Organizational roles and transition to entrepreneurship. Academy of Management Journal, 48(3), 433-449.

Dosi, G. (1982). Technological paradigms and technological trajectories: a suggested interpretation of the determinants and directions of technical change. Research policy, 11(3), 147-162.

Dosi, G. (1984). Technical change and industrial transformation: the theory and an application to the semiconductor industry. Springer.

Dosi, G. (1988). Sources, procedures, and microeconomic effects of innovation. Journal of economic literature, 1120-1171.

Dutta, S., & Weiss, A. M. (1997). The relationship between a firm's level of technological innovativeness and its pattern of partnership agreements. Management science, 43(3), 343-356.

Edge Point, M&A as a Growth Accelerator:
https://www.edgepoint.com/articles/M-A-as-a-Growth-Accelerator

Elsayed, K. (2007). Does CEO duality really affect corporate performance? . Corporate governance: an international review, 15(6), 1203-1214.

Ernst, H. (1998). Patent portfolios for strategic R&D planning. Journal of engineering and technology management, 15(4), 279-308.

Ernst, H., & Vitt, J. (2000). The influence of corporate acquisitions on the behaviour of key inventors. R&D Management, 30(2), 105-120.

Fama, E. F., & Jensen, M. C. (1983). Separation of ownership and control. The journal of law and Economics, 26(2), 301-325.

Folkman, S., & Lazarus, R. S. (1985). If it changes it must be a process: study of emotion and coping during three stages of a college examination. Journal of personality and social psychology, 48(1), 150.

Fich, E. M., Rice, E. M., & Tran, A. L. (2016). Contractual revisions in compensation: Evidence from merger bonuses to target CEOs. Journal of Accounting and Economics, 61(2-3), 338-368.

Fugate, M., Kinicki, A. J., & Prussia, G. E. (2008). Employee coping with organizational change: An examination of alternative theoretical perspectives and models. Personnel Psychology, 61(1), 1-36.

Gambardella, A., Giuri, P., & Luzzi, A. (2007). The market for patents in Europe. Research policy, 36(8), 1163-1183.

Ge, C., Huang, K. W., & Png, I. P. (2016). Engineer/scientist careers: Patents, online profiles, and misclassification bias. Strategic Management Journal, 37(1), 232-253.

Gerpott, T. J. (1995). Successful integration of R&D functions after acquisitions: an exploratory empirical study. R&D Management, 25(2), 161-178.
Cartwright, S. (2002). Why mergers fail and how to prevent it. Business: The Ultimate Resource.

Golbe, D. L., & White, L. J. (1993). Catch a wave: The time series behavior of mergers. The review of Economics and Statistics, 493-499.

Graebner, M. E. (2004). Momentum and serendipity: How acquired leaders create value in the integration of technology firms. Strategic management journal, 25(8-9), 751-777.

Graebner, M. E., & Eisenhardt, K. M. (2004). The seller's side of the story: Acquisition as courtship and governance as syndicate in entrepreneurial firms. Administrative Science Quarterly, 49(3), 366-403.

Graebner, M. E. (2009). Caveat venditor: Trust asymmetries in acquisitions of entrepreneurial firms. Academy of management Journal, 52(3), 435-472.

Graebner, M. E., Eisenhardt, K. M., & Roundy, P. T. (2010). Success and failure in technology acquisitions: Lessons for buyers and sellers. Academy of management perspectives, 24(3), 73-92.

Graebner, M. E., Heimeriks, K. H., Huy, Q. N., & Vaara, E. (2017). The process of postmerger integration: A review and agenda for future research. Academy of Management Annals, 11(1), 1-32.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. Strategic management journal, 17(S2), 109-122.

Grant, R. M. (2002). The knowledge-based view of the firm. The strategic management of intellectual capital and organizational knowledge, 17(2), 133-148.

Griliches, Z. (1979). Issues in assessing the contribution of research and development to productivity growth. The bell journal of economics, 92-116.

Grimpe, C., & Hussinger, K. (2013). Complementarity and Value Capture in Firm Acquisitions: The Role of Intellectual Property Rights. In Academy of Management Proceedings (Vol. 2013, No. 1, p. 12310). Briarcliff Manor, NY 10510: Academy of Management.

Hall, B. H., Jaffe, A., & Trajtenberg, M. (2005). Market value and patent citations. RAND Journal of economics, 16-38.

Hagedoorn, J., & Schakenraad, J. (1994). The effect of strategic technology alliances on company performance. Strategic management journal, 15(4), 291-309.

Hagedoorn, J., & Duysters, G. (2002). External sources of innovative capabilities: the preferences for strategic alliances or mergers and acquisitions. Journal of management studies, 39(2), 167-188.

Hambrick, D. C., & Fukutomi, G. D. (1991). The seasons of a CEO's tenure. Academy of management review, 16(4), 719-742.

Harhoff, D., Scherer, F. M., & Vopel, K. (2003). Citations, family size, opposition and the value of patent rights. Research policy, 32(8), 1343-1363.

Harrigan, K. R., & Di Guardo, M. C. (2017). Sustainability of patent-based competitive advantage in the US communications services industry. The Journal of Technology Transfer, 42(6), 1334-1361.

Harrigan, K. R., Di Guardo, M. C., & Marku, E. (2018). Patent value and the Tobin'sq ratio in media services. The Journal of Technology Transfer, 43(1), 1-19.

Haspeslagh, P. C., & Jemison, D. B. (1991). The challenge of renewal through acquisitions. Planning review.

Hausman, J. A., Hall, B. H., & Griliches, Z. (1984). Econometric models for count data with an application to the patents-R&D relationship.

Hayward, M. L. (2002). When do firms learn from their acquisition experience? Evidence from 1990 to 1995. Strategic management journal, 23(1), 21-39.

Henderson, R., & Cockburn, I. (1994). Measuring competence? Exploring firm effects in pharmaceutical research. Strategic management journal, 15(S1), 63-84.

Helfat, CE, & Klepper, S. (2007). FIVE Project: Data Overview.
http://papers.ssrn.com/paper=1028022.

Hitt, M. A., Hoskisson, R. E., & Ireland, R. D. (1990). Mergers and acquisitions and managerial commitment to innovation in M-form firms. Strategic management journal, 29-47.

Hitt, M. A., Hoskisson, R. E., Ireland, R. D., & Harrison, J. S. (1991). Effects of acquisitions on R&D inputs and outputs. Academy of Management journal, 34(3), 693-706.

Hitt, M.A., Hoskisson, R.E., Johnson, R.A., & Moesel, D.D. (1996). The Market for Corporate Control and Firm Innovation. Acad. Manage. J. 39, 1084–1119.

Hoisl, K. (2007). Tracing mobile inventors—the causality between inventor mobility and inventor productivity. In A study of inventors (pp. 65-119). Deutscher Universitätsverlag, Wiesbaden.

Hofer, C. W., & Charan, R. (1984). The transition to professional management: Mission impossible? . American Journal of Small Business, 9(1), 1-11.

Holmstrom, B. (1989). Agency costs and innovation. Journal of Economic Behavior & Organization, 12(3), 305-327.

Hicks, D., Breitzman, T., Olivastro, D., & Hamilton, K. (2001). The changing composition of innovative activity in the US—a portrait based on patent analysis. *Research policy*, *30*(4), 681-703.

Hussinger, K. (2010). On the importance of technological relatedness: SMEs versus large acquisition targets. Technovation, 30(1), 57-64.

Jackson, S. E., DeNisi, A., & Hitt, M. A. (Eds.). (2003). Managing knowledge for sustained competitive advantage: Designing strategies for effective human resource management (Vol. 21). John Wiley & Sons.

Jaffe, A. B. (1986). Technological opportunity and spillovers of R&D: evidence from firms' patents, profits and market value.

Jayaraman, N., Khorana, A., Nelling, E., & Covin, J. (2000). CEO founder status and firm financial performance. Strategic Management Journal, 21(12), 1215-1224.

Jemison, D. B., & Sitkin, S. B. (1986). Corporate acquisitions: A process perspective. Academy of management review, 11(1), 145-163.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of financial economics, 3(4), 305-360.

Jones-Evans, D., & Westhead, P. (1996). The high technology small firm sector in the UK. International Journal of Entrepreneurial Behavior & Research.

Kaplan, S., & Vakili, K. (2015). The double-edged sword of recombination in breakthrough innovation. Strategic Management Journal, 36(10), 1435-1457.

Kapoor, R., & Lim, K. (2007). The impact of acquisitions on the productivity of inventors at semiconductor firms: A synthesis of knowledge-based and incentive-based perspectives. Academy of Management Journal, 50(5), 1133-1155.

Kesting, P., Ulhøi, J. P., Song, L. J., & Niu, H. (2015). The impact of leadership styles on innovation-a review. Journal of Innovation Management, 3(4), 22-41.

Khachatryan, D., & Muehlmann, B. (2019). Measuring technological breadth and depth of patent documents using Rao's Quadratic Entropy. Journal of Applied Statistics.

Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. Organization science, 3(3), 383-397.

Kogut, B., & Zander, U. (1996). What firms do? Coordination, identity, and learning. Organization science, 7(5), 502-518.

Kor, Y. Y., & Mahoney, J. T. (2005). How dynamics, management, and governance of resource deployments influence firm-level performance. Strategic Management Journal, 26(5), 489-496.

Kozin, M. D., & Young, K. C. (1994). Using acquisitions to buy and hone core competencies. MERGERS AND ACQUISITIONS-PHILADELPHIA-, 29, 21-21.

Krishnan, H. A., Miller, A., & Judge, W. O. (1997). Diversification and top management team complementarity: Is performance improved by merging similar or dissimilar teams? Strategic Management Journal, 18(5), 361–374.

Krause, R., Semadeni, M., & Cannella Jr, A. A. (2014). CEO duality: A review and research agenda. Journal of Management, 40(1), 256-286.

Krug, J. A., & Hegarty, W. H. (1997). Postacquisition turnover among US top management teams: An analysis of the effects of foreign vs. domestic acquisitions of US targets. Strategic Management Journal, 18(8), 667-675.

Krug, J. A., Wright, P., & Kroll, M. J. (2014). Top management turnover following mergers and acquisitions: Solid research to date but still much to be learned. Academy of Management Perspectives, 28(2), 147-163.

Larsson, R., & Finkelstein, S. (1999). Integrating strategic, organizational, and human resource perspectives on mergers and acquisitions: A case survey of synergy realization. Organization science, 10(1), 1-26.

Lanjouw, J. O., & Schankerman, M. (2001). Characteristics of patent litigation: a window on competition. RAND journal of economics, 129-151.

Lee, J. M., Kim, J., & Bae, J. (2020). Founder CEOs and innovation: Evidence from CEO sudden deaths in public firms. Research Policy, 49(1), 103862.

Lengnick-Hall, C. A. (1991). A conceptual framework for evaluating designs for corporate innovation. Journal of Engineering and Technology Management, 7(3-4), 197-227.

Lerner, J. (1994). The importance of patent scope: an empirical analysis. The RAND Journal of Economics, 319-333.

Li, G. C., Lai, R., D'Amour, A., Doolin, D. M., Sun, Y., Torvik, V. I., ... & Fleming, L. (2014). Disambiguation and co-authorship networks of the US patent inventor database (1975–2010). Research Policy, 43(6), 941-955.

Levin, S. G., & Stephan, P. E. (1991). Research productivity over the life cycle: Evidence for academic scientists. The American economic review, 114-132.

Lord, M. D., & Ranft, A. L. (2000). Organizational learning about new international markets: Exploring the internal transfer of local market knowledge. Journal of international business studies, 31(4), 573-589.

Lubatkin, M., Schweiger, D., & Weber, Y. (1999). Top management turnover in related M&A's: An additional test of the theory of relative standing. Journal of management, 25(1), 55-73.

Luo, X., Kanuri, V. K., & Andrews, M. (2014). How does CEO tenure matter? The mediating role of firm-employee and firm-customer relationships. Strategic Management Journal, 35(4), 492-511.

Makri, M., Hitt, M. A., & Lane, P. J. (2010). Complementary technologies, knowledge relatedness, and invention outcomes in high technology mergers and acquisitions. Strategic management journal, 31(6), 602-628.

Mairesse, J., & Mohnen, P. (2004). The importance of R&D for innovation: a reassessment using French survey data. The Journal of Technology Transfer, 30(1-2), 183-197.

Manne, H. G. (1965). Mergers and the market for corporate control. Journal of Political economy, 73(2), 110-120.

Matutes, C., Regibeau, P., & Rockett, K. (1996). Optimal patent design and the diffusion of innovations. The RAND Journal of Economics, 60-83.

Milgrom, P., & Roberts, J. (1988). An economic approach to influence activities in organizations. American Journal of sociology, 94, S154-S179.

Miller, D., Friesen, P. H., & Mintzberg, H. (1984). Organizations: A quantum view. Prentice Hall.

Miller, D. (1990). The Icarus paradox. Harper Collins, New York (1990)

Miller, D. (1993). Some organizational consequences of CEO succession. Academy of Management journal, 36(3), 644-659.

Motohashi, K. (2008). Licensing or not licensing? An empirical analysis of the strategic use of patents by Japanese firms. Research Policy, 37(9), 1548-1555.

Musteen, M., Barker III, V. L., & Baeten, V. L. (2010). The influence of CEO tenure and attitude toward change on organizational approaches to innovation. The Journal of Applied Behavioral Science, 46(3), 360-387.

Nahavandi, A., & Malekzadeh, A. R. (1993). Leader style in strategy and organizational performance: An integrative framework. *Journal of Management Studies*, *30*(3), 405-425.

Nelson, T. (2003). The persistence of founder influence: Management, ownership, and performance effects at initial public offering. Strategic management journal, 24(8), 707-724.

Nerkar, A., & Paruchuri, S. (2005). Evolution of R&D capabilities: The role of knowledge networks within a firm. Management science, 51(5), 771-785

Oakey, R. (1991). High technology small firms: their potential for rapid industrial growth. International Small Business Journal, 9(4), 30-42.

Pablo, A. L. (1994). Determinants of acquisition integration level: A decision-making perspective. Academy of management Journal, 37(4), 803-836.

Paruchuri, S., Nerkar, A., & Hambrick, D. C. (2006). Acquisition integration and productivity losses in the technical core: Disruption of inventors in acquired companies. Organization science, 17(5), 545-562.

Pavitt, K. (1985). Patent statistics as indicators of innovative activities: possibilities and problems. Scientometrics, 7(1-2), 77-99.

Pavitt, K. (1990). What we know about the strategic management of technology. California management review, 32(3), 17-26.

Penrose E. (1959), The theory of the growth of the firm, NY Wiley, New York.

PriceWaterhouse&Cooper. Global M&A Industry Trends: 2021 Mid-year Update. From: https://www.pwc.com/gx/en/services/deals/trends.html

PriceWaterhouse&Cooper. Global M&A Trends in Technology, Media & Telecommunications: 2021 Mid-year Update. From: https://www.pwc.com/gx/en/services/deals/trends/telecommunications-media-technology.html

Puranam, P., Singh, H., & Chaudhuri, S. (2009). Integrating acquired capabilities: When structural integration is (un) necessary. Organization Science, 20(2), 313-328.

Puranam, P., Singh, H., & Zollo, M. (2006). Organizing for innovation: Managing the coordination-autonomy dilemma in technology acquisitions. Academy of Management journal, 49(2), 263-280.

Paruchuri, S., & Eisenman, M. (2012). Microfoundations of firm R&D capabilities: A study of inventor networks in a merger. Journal of Management Studies, 49(8), 1509-1535.

Ranft, A. L., & Lord, M. D. (2002). Acquiring new technologies and capabilities: A grounded model of acquisition implementation. Organization science, 13(4), 420-441.

Rechner, P. L., & Dalton, D. R. (1991). CEO duality and organizational performance: A longitudinal analysis. Strategic management journal, 12(2), 155-160.

Roberts, E. B., & Mizouchi, R. (1989). Inter–firm technological collaboration: the case of Japanese biotechnology. International Journal of Technology Management, 4(1), 43-61.

Rothwell, R. (1984). Technology-based small firms and regional innovation potential: the role of public procurement. Journal of Public Policy, 4(4), 307-332.

Sales, A. L., & Mirvis, P. H. (1984). When cultures collide: Issues in acquisition. *Managing organizational transitions*, *107*(133), 559-569.

Saxton, T., & Dollinger, M. (2004). Target reputation and appropriability: Picking and deploying resources in acquisitions. Journal of Management, 30(1), 123-147.

Schahkerman, Pakes, The Rate of Obsolescence and The Distribution of Patent Values: Some Evidence from European Data, Conference on Quantitative Studies of Research and Development in Industry, L'Institut National de Statistique et des Etudes Economiques, 9-10 September, 1983, Paris.

Scherer, F. M. (1965). Corporate inventive output, profits, and growth. journal of political economy, 73(3), 290-297.

Schweiger, D. M., Ivancevich, J. M., & Power, F. R. (1987). Executive actions for managing human resources before and after acquisition. Academy of Management Perspectives, 1(2), 127-138.

Schweiger, D. M., & DeNisi, A. S. (1991). Communication with employees following a merger: A longitudinal field experiment. Academy of management journal, 34(1), 110-135.

Shleifer, A., L. H. Summers. 1988. Breach of trust in hostile takeovers. A. J. Auerbach, ed. Corporate Takeovers: Causes and Consequences. University of Chicago Press, Chicago, 33–56.

Shleifer, A., & Vishny, R. W. (1989). Management entrenchment: The case of manager-specific investments. Journal of financial economics, 25(1), 123-139.

Simsek, Z. (2007). CEO tenure and organizational performance: An intervening model. Strategic Management Journal, 28(6), 653-662.

Singh, H., & Montgomery, C. A. (1987). Corporate acquisition strategies and economic performance. Strategic Management Journal, 8(4), 377-386.

Smalheiser, N. R., & Torvik, V. I. (2009). Author name disambiguation. Annual review of information science and technology, 43(1), 1-43.

Sorkin, A. R. (2009). More deals likely for Dell. DealBook: The New York Times.

Sorkin, A. R. (2009). In latest deal, Cisco buys Starent for $2.9 billion.

Sørensen, J. B., & Stuart, T. E. (2000). Aging, obsolescence, and organizational innovation. Administrative science quarterly, 45(1), 81-112.

Squicciarini, M., Dernis, H., & Criscuolo, C. (2013). Measuring patent quality: Indicators of technological and economic value.

Staw, B. M., Sandelands, L. E., & Dutton, J. E. (1981). Threat rigidity effects in organizational behavior: A multilevel analysis. Administrative science quarterly, 501-524.

Stein, B., Hoppe, D., & Gollub, T. (2012, April). The impact of spelling errors on patent search. In Proceedings of the 13th Conference of the European Chapter of the Association for Computational Linguistics (pp. 570-579).

Suarez, F. F., & Utterback, J. M. (1995). Dominant designs and the survival of firms. Strategic management journal, 16(6), 415-430.

Swart, J., & Kinnie, N. (2003). Sharing knowledge in knowledge-intensive firms. Human resource management journal, 13(2), 60-75.

Teece DJ., Pisano G., Shuen A. (1997), "Dynamic Capabilities and strategic management", Strategic Management Journal, vol. 18, n. 7, pp. 509-533.

Thompson, J. (1967). Organizations in Action. McGraw-Hill, New York.

Trautwein, F. (1990). Merger motives and merger prescriptions. Strategic management journal, 11(4), 283-295.

Tushman, M. L. (1977). Special boundary roles in the innovation process. Administrative science quarterly, 587-605.

Vermeulen, F., & Barkema, H. (2001). Learning through acquisitions. Academy of Management journal, 44(3), 457-476.

Van Zeebroeck, N. (2011). The puzzle of patent value indicators. Economics of innovation and new technology, 20(1), 33-62.

Waldman, D. A., Ramirez, G. G., House, R. J., & Puranam, P. (2001). Does leadership matter? CEO leadership attributes and profitability under conditions of perceived environmental uncertainty. Academy of management journal, 44(1), 134-143.

Walsh, J. P. (1988). Selectivity and selective perception: An investigation of managers' belief structures and information processing. Academy of Management journal, 31(4), 873-896.

Walters, B. A., Kroll, M. J., & Wright, P. (2007). CEO tenure, boards of directors, and acquisition performance. Journal of Business Research, 60(4), 331-338.

Wernerfelt B. (1984), "A resource-based view of the firm", Strategic Management Journal, vol. 5, n. 2, pp. 171-180.

Winter, S. G. (1984). Schumpeterian competition in alternative technological regimes. Journal of Economic Behavior & Organization, 5(3-4), 287-320.

Winter, S. G. (1987). Knowledge and competence as strategic assets. DJ Teece, ed. The Competitive Challenge: Strategies for Industrial Innovation and Renewal. Cambridge Ma.: Ballinger.

Winter, S. G., & Nelson, R. R. (1982). An evolutionary theory of economic change. University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship.

Worthen, B. (2009, February 17). Oracle scoops up bargains in recession spree. Wall Street Journal, p. A1.

Wu, S., Levitas, E., & Priem, R. L. (2005). CEO tenure and company invention under differing levels of technological dynamism. Academy of Management Journal, 48(5), 859-873.

Wulf, J., & Singh, H. (2011). How do acquirers retain successful target CEOs? The role of governance. Management Science, 57(12), 2101-2114.

Zaccaro, S. J., & Klimoski, R. J. (Eds.). (2002). The nature of organizational leadership: Understanding the performance imperatives confronting today's leaders (Vol. 12). John Wiley & Sons.

Zaheer, A., Castañer, X., & Souder, D. (2013). Synergy sources, target autonomy, and integration in acquisitions. Journal of Management, 39(3), 604-632.

Zenger, T. R. (1994). Explaining organizational diseconomies of scale in R&D: Agency problems and the allocation of engineering talent, ideas, and effort by firm size. Management science, 40(6), 708-729.

Zenger, T. R., & Lazzarini, S. G. (2004). Compensating for innovation: Do small firms offer high-powered incentives that lure talent and motivate effort?. Managerial and Decision Economics, 25(6-7), 329-345.

Zhou, B., Dutta, S., & Zhu, P. (2020). CEO tenure and mergers and acquisitions. Finance Research Letters, 34, 101277.