Acquirer’s Absorptive Capacity and Firm Performance: The Perspectives of Strategic Behavior and Knowledge Assets

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Abstract: In this study, we underline the importance of the relationship between absorptive capacity and an acquiring firm’s post-merger performance following the acquisition of a target firm’s knowledge through cross-border mergers and acquisitions (CBMAs). We analyzed CBMAs between developed countries to highlight how realized absorptive capacity plays a crucial part in a firm’s achievement of CBMA sustainability. Using United States CBMA transactions with other developed countries during 2000–2014, our findings suggest that an acquiring firm’s greater absorptive capacity leads to better post-merger performance. More interestingly, compared to for domestic M&As, the direct effect between absorptive capacity and post-merger performance was found to be more positively related in CBMA transactions, even when we applied propensity-score matching (PSM) and Heckman’s selection model to the same estimation. In addition, we introduce four moderating variables that could either intensify or lessen a firm’s effort to seek external knowledge for organizational growth. In terms of an acquiring firm’s strategic behavior, we find that paying in cash and past CBMA experiences positively influence a firm’s post-merger performance. For a target firm’s knowledge assets, we show that when a target firm possesses more strategic assets, they reinforce the acquiring firm’s post-merger performance, and when the target firm is in a high-tech industry, the acquiring firm’s post-merger performance is weakened. Our study contributes to the CBMA literature by incorporating the concept of a knowledge-based view and by empirically testing the different effects of absorptive capacity between domestic M&A and CBMA and how both strategic behavior and a target firm’s knowledge assets affect a firm’s post-merger performance related to CBMA sustainability.

Keywords: absorptive capacity; cash payment; cross-border M&A; high-tech industry; knowledge acquisition; past experience; strategic asset

1. Introduction

From the era of the fifth merger wave, and especially since the late 1990s, the booming of international trade and fortifications of different geographic locations has encouraged firms to widen their views to carry out cross-border mergers and acquisitions (CBMAs) and accelerate at a rapid pace [1]. Such a shift in a firm’s action illustrates the significance that the nature of M&A has on a firm’s fate and its sustainable competitive advantage [2–4]. Accordingly, a developing firm’s sustainability via CBMAs has caught the attention of both scholars and practitioners lately [5], because CBMAs allow firms to achieve a sustainable competitive advantage in various ways. Hitt and Pisano [6]...
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mentioned that growth limitations within the current market can be weakened by acquiring firms that are headquartered in foreign countries and that CBMAs allow firms to better contend with competitors that operate in diverse international markets. Along these lines, CBMAs enable firms to obtain privileged information and opportunities to increase the odds of favorable circumstances for future growth [7] and to explore novel strategic assets [8,9]. Through such activity, acquiring firms can achieve CBMA sustainability, which involves fostering improved post-merger performance and accomplishing sustainable development in the long haul [10]. Therefore, enlarged globalization and intensified global competition spontaneously lead firms to explore new markets that are not based in their current operating country [11].

Meanwhile, Hitt, et al. [12] showed that when firms choose to expand their current operation to a foreign market, they confront various options for how they are going to execute the process. One of the issues that firms need to address is the location of the target company (e.g., developed or developing countries). The decision on the target location is crucial, since it may profoundly affect the operation and profitability of the parent firm [13–15]. If firms experience poor post-merger performance, the main features of CBMA, namely, gaining access to new markets and broadening the scope of geographical distribution [16], become weakened and thus result in worsening the firm’s CBMA sustainability. Even though previous studies [17–19] empirically analyzed the difference in acquirers’ post-merger performance in terms of transactions between developed and developing countries, the studies were less focused on explaining distinct characteristics within the acquirers’ perspective, and this leads to a question of whether the acquirers’ status could influence the location decision. Morck and Yeung [20] stated that firms should engage in international expansion when they can bolster their value by internalizing intangible assets, such as technological know-how. Their study indicated that acquiring firms were able to gain abnormal returns via CBMAs and that such companies held information-based resources that favored their efficient internalization of assets they obtained from target companies [1]. Thus, we could suspect that the size of the information-based resources that firms can effectively maintain and use may influence them to a greater extent when making location decisions.

Since studies of CBMAs mostly underexplore domestic M&As [21], in this study, we endeavor to further contribute to current CBMA literature on sustainability by building upon theories of absorptive capacity and a knowledge-based view, based on which the foundation of knowledge affects the firms’ learning ability and promotes their gaining of a sustained competitive advantage [22]. As absorptive-capacity literature [23,24] states, it is essential for firms to comprehend the gravity of merging external knowledge with internal knowledge that can be used commercially. Such an implication is decisive for a firm’s sustainable performance, because the degree of absorptive capacity affects the firm’s foundation for effectively promoting and applying explicit knowledge [25]. Additionally, by harnessing both internal and external resources, firms can expand their intellectual capital that can be converted into a knowledge-based competitive advantage [26]. Thus, how effectively firms transform and merge their external resources with internal resources affects how much the firm maintains its intangible assets that could readily be used in the future.

We have chosen absorptive capacity for several reasons. First, there has been limited research analyzing absorptive capacity in terms of M&A literature [27]. Second, absorptive capacity is an essential governance mechanism that influences a firm’s performance. Zollo and Singh [28] mentioned that combinative capabilities are essential in order for firms to incorporate and expand new knowledge. Thus, if firms have weak absorptive capacity in terms of combinative capabilities, it would be problematic for such firms to integrate external strategic assets, which could diminish their performance. Last, the magnitude of absorptive capacity matters when firms choose to adopt CBMAs. Deng [25] stated that an expansion strategy, such as CBMAs, requires firms to recognize the importance of incorporating a firm’s absorptive capacity and that the success of CBMAs does not depend solely on finding the right transaction but also on the level of development of a firm’s absorptive capacity, which influences whether firms can effectively manage the integration effort.
Consequently, from the previous literature, we realized that absorptive capacity is a crucial component when analyzing a firm’s post-merger performance in terms of CBMA sustainability. In this line, we aim to search for the reasoning behind how absorptive capacity plays a crucial role in CBMA sustainability. González-Torres, Rodríguez-Sánchez, Pelechano-Barahona and García-Muñá [3] mentioned that the effect of sustainability issues on firm performance is receiving increased attention in the M&A context. The term sustainability is composed of three aspects: environmental, economic and social. Among those, a firm’s financial performance in terms of M&A is highly related to the economic pillar of sustainability, because economic sustainability explains the economic value generated by firms in its external context, promoting future prosperity [3]. In this vein, we adopted the concept of absorptive capacity as being a driver for promoting a firm’s CBMA sustainability by achieving better post-merger performance. We have also considered the different significance of absorptive capacity between domestic M&A and CBMA, since comparative studies on such an agenda are rare, a gap that we aim to fill. Furthermore, we analyzed four moderators that could have different effects on post-merger performance. There are existing studies that have examined features related to either the acquirer’s side [8,29] or the target firm’s side [30] and to either home [17] or the host country [19] in the CBMA context. However, these studies were mainly focused on developing countries (e.g., China) as home countries or neglected to look into firm-specific aspects, such as absorptive capacity. Therefore, in order to fill such a gap, we not only analyzed firms that reside in developed countries but also conducted an empirical test of the characteristics of both acquiring and target companies. Specifically, we incorporated the acquiring firm’s strategic behavior and the target firm’s knowledge to explain four moderators: cash payment, past CBMA experience, strategic assets, and high-tech industry. We argue that each moderator could influence the direct effect between absorptive capacity and post-merger performance. To the best of our knowledge, literature that simultaneously tackles both acquiring and target firms is very limited. This study thus will be structured as follows. First, we explain the reason behind the importance of CBMAs as a reliable tool for firms to initiate knowledge acquisition with. Next, we show the significance of a firm’s absorptive capacity when acquiring novel external resources to promote a firm’s CBMA sustainability. In addition, we discuss four moderators—cash payment, past CBMA experiences, strategic assets, and high-tech industry—to analyze the effects on acquiring firms’ post-merger performance. In the last section, we discuss the results and conclude.

2. Literature Review and Hypothesis Development

2.1. The Role of CBMA in Knowledge Acquisition

Firms may create better knowledge through research and development (R&D) activity within their own boundary. However, such a strategy may not always be the best option because of limited knowledge resources and is thus an inefficient way to create knowledge [31]. To reduce such inefficiency, a firm could obtain the necessary knowledge from other companies by means of the transferring process [32]. Even though knowledge is, in general, deeply rooted inside a firm, inherent knowledge could be developed by acquiring other firms by means of transferring activity with different business tactics [33–35]. For instance, CBMAs could relocate external knowledge from target companies into an acquiring firm’s competitiveness [36]. Specifically, the transferring process in CBMAs involves not only encouraging new employees from the target firm to share the possessing knowledge but also dedicating employees from acquiring firms to learn the target firm’s knowledge [37]. Moreover, from acquiring a firm’s perspective, knowledge transfer implies more than just learning external knowledge, because the acquirer could exploit absorbed knowledge into commercialized assets [38]. Hence, throughout the procedure of learning and adapting new knowledge into profit creation, acquiring firms could increase their competitive advantage [39] and thus achieve CBMA sustainability. Accordingly, many studies of CBMAs are conducted from emerging nations for promoting new knowledge. Especially, investment from China is studied the most for learning superior knowledge for
advanced nations within diverse industries [40–42]. In a knowledge-based view, such phenomena imply that it is instinctive for a firm to carry out specific strategic actions.

Kogut and Zander [43] and Grant [44] mentioned that a firm should regard knowledge as the most fundamental and intrinsic factor for sustaining its business. From this view, a firm is an aggregation of accumulated know-how and assets, and is an organization that applies internal knowledge into a business landscape [43–45]. From a knowledge-based perspective, a firm’s knowledge is defined as “owning a portfolio of options, or platforms, on future developments” [43]. Thus, simply possessing knowledge itself does not directly lead to a firm’s success, but firms should turn their knowledge into real value to use in the market, which involves choosing the best knowledge option that would increase a firm’s CBMA sustainability. For instance, firms carrying broader and deeper knowledge could create radical innovations [46]. Furthermore, firms could benefit financially and keep their competitiveness by means of knowledge, such as intellectual capital or relation capital [47]. Thus, we consider that firms possessing both more and better knowledge that could be transformed into commercial use would bring a better possibility for firms to keep their sustainability.

Despite such a desire by firms to carry out CBMAs, however, many CBMAs turn out to be failures or result in negative firm performance. For example, an unexpected result from CBMAs could emerge from the process of harmonizing the unexperienced culture from target firms [48–50]; different languages creating conflict between the acquiring firm and the target company in the assimilating process [51]; inaccurately forecasting the target firm’s assets, which leads firms to pay more than the expected outcome [52,53]; obtaining excessively different knowledge that is hard to mingle with internal assets [54]; the liability of foreignness [55]; or not understanding inherent firm value by expecting similar outcomes because of the same nationality of foreign target firms [56]. The above-mentioned issues may result in substantial information asymmetries that, in turn, could negatively influence the acquiring firm’s post-merger performance when engaging in CBMA relative to domestic M&A [21]. Nevertheless, when the conflict is solved by means of a well-designed integrating process, a firm succeeds in absorbing and exploiting unknown knowledge, and thus the benefit from CBMAs is enormous [57–60]. To eliminate the vulnerability coming from the knowledge-transfer process, acquiring firms should establish their method of absorbing and creating value from the target firm’s knowledge [25,28]. Only then can the acquiring firm avoid an unfavorable result by applying the proper routine while absorbing external knowledge from the target company [61]. Moreover, an acquiring firm should create a new routine that raises the firm’s capability to combine new knowledge by increasing R&D investment [24,39,62]. Therefore, it is imperative for firms to increase their absorptive capacity. By both selecting from obtained external knowledge and creating internal knowledge by means of higher exploitation capability, firms could achieve successful CBMA sustainability via superior post-merger performance. Such implications may also differ between domestic M&A and CBMA. Lin, et al. [63] compared the moderating effects of both developed and underdeveloped institutional development on M&A into two countries, China and the United States. They found that the level of institutional development was affected differently according to the subsequent number of acquisitions. In this line of reasoning, we also realized that the significance of the absorptive capacity’s effect could differ between domestic M&A and CBMA.

2.2. Absorptive Capacity and Sustainable Performance in CBMAs

Cohen and Levinthal [64] established the concept of a firm’s absorptive capacity, explaining that a firm’s R&D investment is one of the most profit-maximizing behaviors in combining new assets. Since one purpose of CBMA is to increase a firm’s performance by means of synergy creation by absorbing outside resources, four steps of this capability, “acquisition, assimilation, transformation, and exploitation”, with profit-making action should be undergone [24]. After absorbing extrinsic knowledge by means of target firms, acquiring firms need to apply and create a new outcome for the firm’s improved performance [64]. Thus, when a firm takes action, such as carefully observing complementary knowledge or investing more in R&D, a firm could increase its absorptive capacity to
exploit combined knowledge into better sustainable development. Previous literature used an acquiring firm’s absorptive capacity as a moderator that would have a positive influence on a firm’s financial performance [65,66]. Some studies supported that an acquirer’s absorptive capacity leads to a positive indirect effect on firm performance [67,68]. Nevertheless, we found that the literature on the direct relation between an acquiring firm’s absorptive capacity and financial performance in the CBMA context seems to be less focused. Björkman, et al. [69] pointed out the idea that the firm performance should be observed with the importance of the acquirer’s ability to assimilate outside resources in terms of CBMAs.

In this respect, Zahra and George [24] analyzed the firm’s absorptive capacity with four steps, which could be differentiated into two types of absorptive capacity: potential and realized absorptive capacity. The firm’s potential absorptive capacity can acquire and assimilate knowledge, whereas realized absorptive capacity positively influences a firm’s outcome by means of a transforming and exploiting process [24]. As opposed to a firm’s exploration activity to find new knowledge resources, a firm’s exploitation activity uses the possessed knowledge for the firm’s prosperity [70]. Thus, we apprehend the importance of firms with high exploitation capabilities, since such an aspect would create more value than would firms with lower realized absorptive capacity [24]. According to Meyer and Sinani [71], economically developed countries tend to have better realized absorptive capacity than developing countries have. High realized absorptive capacity from advanced nations would be more benefited than emerging countries would, because of the high spillover effect from the investment [71]. Additionally, we assume that when firms with high realized absorptive capacity own knowledge that is more progressive, it would create more synergistic performance. As mentioned above, we consider that firms in developed countries possess more advanced knowledge than developing countries do. Therefore, we highlight the importance of CBMA transactions between firms from developed countries.

The existing literature explained the importance of the level of an acquiring firm’s absorptive capacity [64,72]. Tsai [72] mentioned that firms could use more knowledge when they have a high rather than low absorptive capacity, because of their eagerness to increase the odds for further growth [64]. Furthermore, firms with better absorptive capacity are more likely to succeed in CBMA for a couple of reasons. Zahra and Hayton [66] stated that a higher level of an acquiring firm’s absorptive capacity increases the firm’s future performance when obtaining both related and unrelated knowledge. The acquiring firm could increase its absorptive capacity by taking the newly obtained knowledge assets that complement already possessed assets [67]. Additionally, the unexpected and frustrating outcomes from different cultures when obtaining new knowledge were also diminished because of high absorptive capacity [73]. Thus, we assume that when an acquiring firm’s absorptive capacity is larger, the acquirer could achieve CBMA sustainability by realizing improved post-merger performance.

**Hypothesis (H1).** When a firm is investing by means of CBMAs, a high level of acquirer’s absorptive capacity is positively related to post-merger performance.

2.3. Moderators: Acquiring Firm’s Strategic Behavior and Target Firm’s Knowledge

We emphasized a firm’s realized absorptive capacity to demonstrate the importance of exploitation capabilities for achieving CBMA sustainability via better post-merger performance. We go further by arguing that some different aspects of firms should be navigated, as should how each factor may influence a firm’s CBMA sustainability via its effect on the firm’s post-merger performance. The existing literature has focused on either an acquiring firm’s [8,74] or target firm’s perspective [30]. We intend to fill this gap by using both contexts as moderators. To discuss the characteristics of an acquiring firm in our study, we approach the contexts in terms of a firm’s strategic behavior. With this behavior, firms act to explore for new advantages so that they can further promote their CBMA sustainability [75]. A firm’s choice should be rational and analytical, mostly decided by top managers of the firm, to adapt
to a business landscape [76]. In the CBMA context, an acquiring firm should choose the most optimal strategy to strengthen post-merger performance while acquiring the target firm. A firm’s strategic behavior may pursue a better integration level in order to achieve synergistic value [57]. In this respect, we assume that an acquiring firm’s behaviors are a valuable source for stimulating the use of new knowledge to improve its performance. From the target firm’s view, we expect that acquiring external knowledge can have a distinct effect on an acquiring firm’s performance. Unpossessed resources from outside the company provides advantages in increasing an acquiring firm’s sustainability by means of synergy creation [77]. Makri, et al. [78] emphasized that this could be applied from a knowledge perspective and highlighted the importance of a target firm’s knowledge characteristics. For instance, the similarity and complementarity of external knowledge could explain the success of M&A [78]. Not only considering characteristics based on the relatedness or type of knowledge, Han, et al. [79] increased this stream by adding the quantitative features of a target firm’s knowledge, which positively influence an acquiring firm’s performance. In this regard, different characteristics of knowledge from target firms should be discussed in order to explain a firm’s achievement of CBMA sustainability.

First, we describe the acquirer’s strategic behavior, explaining the intrinsic value with the payment method in CBMA transactions. We suppose that types of payment methods for CBMA transactions are related to how firms actively participate in searching for sophisticated knowledge. Cash payment is expected to bring better financial performance by an acquiring firm, since the transaction would be more straightforward and analyzing the target firm’s assets would be well recognized [80]. Next, prior CBMA experience could also be considered as being another strategic behavior of the firm. We expect that prior experience could show firms’ creation of future directions or chances for better exploitation by turning the absorbed knowledge into commercial ends that lead firms to achieve CBMA sustainability. From past experience, acquiring firms would have the know-how to successfully integrate the new knowledge and avoid the unnecessary process that comes from different countries [81].

From the target firm’s knowledge perspective, we consider the knowledge that a target possesses in terms of the quantity of knowledge and the type of knowledge. We suspect that an acquiring firm would pursue external knowledge as an opportunistic space, which would ultimately lead firms to attain CBMA sustainability. First, we expect that when the firm possesses more strategic assets, that will improve its performance [82]. We apply this idea to the CBMAs’ context. We assume that different amounts of strategic assets of the target firm would have a distinct outcome on an acquiring firm’s post-merger performance. Finally, we consider whether the knowledge of the target firm is that of a high-tech industry. Even though obtaining high-tech knowledge from the target firm could positively affect the acquirer’s knowledge reservoir, an adverse effect (e.g., resource redundancy) could negatively affect an acquiring firm’s CBMA sustainability [83]. Therefore, we conclude that the target firm within a high-tech industry would have an unfavorable effect. We consider that four different characteristics could be the factors that affect the firm’s absorptive capacity and lead to different performance outcomes for a firm’s CBMA sustainability.

2.3.1. Acquirer’s Strategic Behavior: Payment Method of Cash

The choices of payment method in M&A transactions have been mostly classified as cash, stock, mixed cash and stocks, and security payments [84–86]. Among them, cash payment is considered a reliable method for the acquiring firm when firms try to gain the upper hand against their rivals [87]. Bidding with cash would be more likely to win the M&A transaction, since the target firm prefers to be paid in cash rather than with stock options, which might have a liquidity issue [85].

We expect that cash payments would bring synergy in the relationship between an acquiring firm’s absorptive capacity and future sustainable performance, because of the complexity of the deal coming from the payment method in CBMA transactions. When the deal becomes complicated, especially with stock payments, the deal duration is more likely to be longer [80]. Moreover, if information asymmetry is low with the target firm, an acquiring firm would prefer to use cash payment [88]. We assume that when the deal is conducted via cash payments, the unnecessary process can be eased,
and the deal becomes short and straightforward. Less complexity with cash payment rather than stock payment would lead an acquiring firm to predict the future outcome more easily because of clearly understanding a target firm’s assets [81]. Therefore, we argue that cash payment would result in a better positive outcome in the relationship between absorptive capacity and post-merger performance in order for firms to achieve CBMA sustainability.

**Hypothesis (H2).** When a firm is investing by means of CBMAs, the contracted deal with cash positively moderates the relationship between the acquirer’s absorptive capacity and its post-merger performance.

### 2.3.2. Acquirer’s Strategic Behavior: Past CBMA Experiences

Many studies imply that an acquiring firm’s past CBMA experience has a positive effect on its onward CBMA performance [89–93]. Overall, M&A experience would bring know-how in learning and absorbing external knowledge, which, in turn, enables firms to create future synergy. From the knowledge-based view, learning from feedback and repeating the results of M&A would bring insights for firms for choosing the essential knowledge to combine [91,94]. Successful acquisition experience would lead firms to be more certain in using M&A transactions for further growth [95]. Although this phenomenon could be applied to the CBMAs [81], compared to domestic M&As, CBMAs require firms to further understand how to adapt to foreign countries with issues pertaining to their distinct characteristics.

Firms with no experience of past CBMAs would suffer from culture clash from the target firm. However, if firms have experience with many CBMAs, they would adapt to the culture collision [74,96]. Furthermore, Collins, Holcomb, Certo, Hitt and Lester [82] indicated that firms with past cross-border experience would prevent unnecessary procedures that come from different country-level backgrounds. Such procedures may include adapting to a new legal, economic, or political environment, given which a firm should put more effort into fitting into a diverse business environment. By being exposed to a previous new legal system, the acquirer creates an efficient way to become familiar with new conditions and successfully reforms after acquiring a foreign firm [97]. Furthermore, from experience, firms would be in a better position to evaluate the strategic complementarity that comes from similar corporate values [57], the degree of integration [57,98], and combinative capabilities [39], which could also be the factors that would lead to successful CBMA when absorbing new knowledge assets.

Thus, the previous CBMA experience would improve a firm’s understanding of future investment, since the acquirer already has the know-how to overcome those difficulties. Prior experience may not only directly influence the firm’s financial performance but also be related to its absorptive capacity, which may lead to better sustainable performance. Li, Li and Wang [73] stated that a firm’s past experience could be a major factor in improving its absorptive capacity and may diminish the negative effect that cultural differences may have on a firm’s performance. Therefore, we hypothesize that past CBMA experience would help firms gain CBMA sustainability by improving future prosperity in a firm’s post-merger performance.

**Hypothesis (H3).** When a firm is investing by means of CBMAs, past CBMA experiences positively moderate the relationship between the acquirer’s absorptive capacity and its post-merger performance.

### 2.3.3. Target Firm’s Knowledge: Amount of Strategic Assets

A strategic asset can be exemplified as an enterprise’s “know-how, knowledge, and advanced technologies” and should be “valuable, rare, inimitable, and non-substitutable”, which later on create a firm’s competitive advantage [99–102]. Moreover, a strategic asset does not merely denote a firm’s knowledge but also includes the organizational culture, brand, R&D capabilities, reputation,
and relationship with other firms [102,103]. The more a firm possesses such resources, the more it can choose the best strategy in a diverse business environment.

A strategic asset may be generated by means of a firm’s own R&D activity, but embedded strategic assets could also be cultivated by means of its foreign direct investment activities, such as CBMAs. CBMAs are one of the most efficient tools for obtaining concealed strategic assets [104]. Therefore, we consider that strategic assets created by means of not only a firm’s internal R&D activity but also strategic assets obtained from the target firm would increase an acquiring firm’s post-merger performance. The more strategic assets that the target firm carries, the more an acquiring firm could use them for commercial value by means of new unique resources. Previous studies provided empirical results that a firm’s strategic assets could improve its financial performance [82,105,106]. Therefore, we further expect that the amount of strategic assets owned is highly related to the firm’s CBMA sustainability via increased financial prosperity. A case study explaining CBMAs for advanced strategic assets is Lenovo from China acquiring IBM’s PC sector from U.S. [40]. Deng [40] explained that the CBMA transaction of the Lenovo–IBM PC sector provided a significant chance to Lenovo to learn more advanced strategic know-how related to the technology, management, and global sales strategy of IBM.

The external strategic asset could also bring a positive influence on an acquiring firm’s absorptive capacity, leading to better firm performance. A firm does not always possess the necessary strategic assets. In such regard, a firm may become eager to use strategic assets created externally by transferring means of CBMAs [40,73]. For instance, a firm’s intellectual capital (e.g., human capital and structural capital) positively influences its absorptive capacity [107]. Furthermore, an acquiring firm could learn how to increase R&D capability by obtaining a foreign firm that possesses large strategic assets [40]. Thus, we assume that if the target company possesses more strategic assets, an acquiring firm could further increase its CBMA sustainability by experiencing improved post-merger performance.

**Hypothesis (H4).** When a firm is investing by means of CBMAs, the amount of the target firm’s strategic assets positively moderates the relationship between the acquirer’s absorptive capacity and its post-merger performance.

### 2.3.4. Target Firm’s Knowledge: High-Tech Industry

Firms in the high-tech industry have more vulnerability than other types of industries have, because companies that are dependent on technology should create profound knowledge continuously and need to discover new knowledge faster than other industries need to [108]. Firms in a high-tech industry struggle to expand their leverage by investing more in R&D expenses than low- or medium-tech industries do. Moreover, the product life cycle has been shortened in the field of high-tech industry [109]. Thus, newcomers or lagging companies may experience difficulties when trying to catch up with competitors that possess up-to-date technology. To fill such a gap, transferring activity by means of CBMAs might be the best way to advance their knowledge to fit [110]. Prior literature describes the significance of transferring high-tech knowledge and its absolute aftereffect. For instance, when the acquiring firm engages in an M&A transaction for high-tech knowledge, a positive influence is exhibited by its innovation performance [89].

However, even though firms increase their innovative performance, it is ambiguous whether innovation outcomes directly lead firms to achieve CBMA sustainability. First, high-tech knowledge is more likely to be path-dependent [111]. Because high-tech knowledge might be more deeply rooted within the firm, compared to knowledge from other industries, fully understanding and exploiting such knowledge could require more effort for acquiring firms. Second, acquiring firms could experience diminished financial outcomes from combining external high-tech knowledge because of resource redundancy [83]. Therefore, we assume that knowledge from a target company within a high-tech industry would have a negative effect on the relationship between an acquiring firm’s absorptive capacity and post-merger performance, weakening the firm’s CBMA sustainability.
**Hypothesis (H5).** When a firm is investing by means of CBMAs, knowledge acquired from high-tech target firms negatively moderates the relationship between the acquirer’s absorptive capacity and its post-merger performance.

3. Data and Methodology

3.1. Sampling and Data Collection

For this study, we extracted a sample from US-based acquisitions in other developed countries between 2000 and 2014 in order to analyze the acquiring firm’s CBMA sustainability. We limited our study to acquiring firms in the US for several reasons. First, previous literature touching on CBMAs is generally limited to non-US-based firms [70,112]. Second, the literature on the firm’s absorptive capacity and financial performance with CBMAs for acquiring advanced knowledge is mainly based on non-US firms [70,73]. For instance, literature about China is found because of their advanced knowledge purposes [25,73,92]. Third, because developed countries tend to have better realized absorptive capacity than developing countries do [71], we narrowed our scope to US-based firms, since we highlight a firm’s realized absorptive capacity that relates to exploitation capability leading towards a firm’s CBMA sustainability. Additionally, we consider that the synergy created by firms from a high realized absorptive capacity would be more significant when combining external knowledge that is more progressive. Therefore, we collected target firms from other developed countries, since advanced knowledge assets are more likely to be carried in developed countries rather than in emerging nations [42]. For instance, Google from the United States acquired a firm from the United Kingdom called DeepMind Technologies in 2014. The purpose of Google’s overseas investment was to acquire the new artificial intelligence (AI) knowledge of DeepMind Technologies that would complement the knowledge Google already had. In this regard, we chose the target countries classified as developed countries in the list of Organization for Economic Cooperation and Development (OECD).

We gathered data by means of two steps. First, we collected M&A transactions from the US with other developed countries from 2000 to 2014 by means of the SDC Platinum database. After retrieving M&A transactions, we collected financial data from WRDS COMPUSTAT. However, we were not able to include M&A transactions that did not provide useful financial data. By removing M&A transactions with missing financial data, we collected 141 CBMA transactions for the final analysis. Combs [113] mentioned that the sample size should be at least 100 for the measure to be valid. Thus, our study with 141 samples would be reliable for the analysis.

3.2. Dependent Variable

**Tobin’s Q.** We used Tobin’s Q to measure the acquiring firm’s post-merger performance,

\[ TQ_t = \frac{MV_t}{RV_t} \]

As illustrated above, \( MV \) is the firm’s total market value and \( RV \) is the replacement value of the firm’s total assets. Tobin’s Q is often used to estimate the creation of new outcomes [1] or the future performance of a CBMA [114] and displays both the return of a firm’s strategy and its predicted outcome [115]. Chen and Lin [116] and Wang, et al. [117] incorporated Tobin’s Q by measuring the corporate performance to address the future growth opportunities of observed firms. Since we evaluate the absorptive capacity’s effect on future financial performance in terms of CBMA sustainability, we have also adopted Tobin’s Q by following their study. In terms of the time period of measuring a firm’s financial performance, Zhu, Xia and Makino [51] observed a three-year effect, since that specific timespan is proper for measuring the elapsed time that covers the effect on firms to change from a perceived effect [118]. In this context, since we focused on the aftermath of a firm’s CBMAs activities for acquiring and absorbing novel external knowledge, it would take time for acquiring firms
to integrate and transform it for commercial use. Therefore, we also observed a three-year period in
order to capture the precise timespan for a perceived effect.

3.3. Explanatory Variables

Absorptive Capacity. We used an acquiring firm’s R&D intensity to measure its absorptive
capacity. R&D intensity, which is R&D expenditure divided by total sales, has long been used to explain
the absorptive capacity of the firm [64]. After a firm’s absorptive capacity had been conceptualized for
decades, there were studies suggesting a different approach, assuming that R&D intensity was an outdated
measurement [23,119]. Although R&D intensity is viewed as old-fashioned, Schildt, et al. [120] argued
that this measurement is still popular and useful for explaining the exploitation of absorptive capacity.
Recent studies have still used it as an indicator of a firm’s absorptive capacity [120–122] and also in terms
of CBMA [123].

Cash Payment. To identify whether the acquiring firm used cash as a payment method, we used
a dummy variable; if the process occurred by means of cash, it was marked as 1—if not, 0 [80].

Past CBMA Experiences. Past CBMA experiences were counted as whether the acquirer had
international expansion experience by means of M&A within the past three years [81].

Strategic Asset. We discuss the measurement of strategic assets by means of various approaches.
Although measurements based on a firm’s R&D activity could explain its strategic assets, this indicator
cannot quite fulfill the characteristics of what Barney [99] stated for a firm’s strategic asset [124]. A firm’s
intangible assets, which include its patents, trademarks, network, and corporate culture [125], seem to
possess the characteristics of “valuable, rare, inimitable, and non-substitutable”. Michalisin, Smith
and Kline [103] argue that a firm’s strategic assets are more likely to be intangible rather than tangible.
Therefore, we used the amount of a target firm’s intangible assets to measure its strategic assets.

High-Tech (Target). We used a dummy variable to indicate whether the target firm was in
a high-tech industry or not. If the first three digits of the SIC code included 283, 357, 366, 367, 382, 384,
481, 489, 737, or 873, we marked it as 1—otherwise, as 0 [126].

3.4. Control Variables

Acquisition Year. We controlled year variables from 2001 to 2014. Hasija, et al. [127] stated that
a firm’s performance is negatively related to the global-level risks, such as economic insecurity or
political issues between countries, in terms of CBMA. These risks are not consistent but appear in
a certain year. For instance, an acquiring firm’s performance would be negatively affected in a certain
year, such as in the global crisis from 2007 to 2008, which led the economic performance of overall
industries to decline [127].

Firm Size. An acquiring firm’s size could present an advantage by means of economies of scale
when absorbing and using new knowledge assets from the target firm [73]. Hence, we controlled
the acquiring firm size measured by the amount of total assets.

Return on Assets. We measured an acquiring firm’s return on assets, which explain the firm’s
profitability, by the firm’s net income divided by the total assets. We controlled for the firm’s return
on asset (ROA) level, since it might have an increasing effect on absorptive capacity up to a certain
level [73,127].

Firm Age. We counted firm age by subtracting the year the deal closed from the year the acquiring
firm was established. Following Flatten, et al. [128], we controlled for the firm age, because young
companies are more likely to enjoy using their resources than are old firms.

Deal Duration. We measured deal duration by subtracting the day the deal was completed from
the day the deal was announced. We controlled for deal duration because the deal would take more
time when it was more complicated, which might affect the cost of the deal [80].

Deal Value. We measured the deal value as the transaction value of the price paid by an acquiring
firm in the period of the deal conclusion. Since deal value has been used as a control variable when
measuring a firm’s performance in the M&A literature, we also controlled for the deal value [129].
High-Tech (Acquirer). Similar to the moderating variable of a target’s high-tech above, we used a dummy variable of if the firm was high-tech or not. We controlled for a target’s being in a high-tech industry because, according to Nunes, et al. [130], the growth effect from the R&D intensity level differs between a high-tech firm and a non-high-tech firm.

Language. Language is known to have a crucial influence on CBMA when combining external knowledge [51]. Dow and Karunaratna [131] created a standard for coding the language difference by using language branches and families. The range is one to five, and if the language shared the second-level sub-branches, which means that the languages were more than 90 percent similar, we coded the difference as 1, but if the languages of the two firms did not even share the same family, which was less than one percent, we coded it as 5.

Industry Relatedness. We also controlled for industry relatedness, since knowledge that is already known and experienced is more comfortable to learn [54]. Delgado, et al. [132] used the the North American Industry Classification System (NAICS) code to explain industry relatedness. We used a dummy variable for whether the first three digits were the same; then, the target and acquirer were in a similar industry and were coded as 0—otherwise, as 1.

3.5. Estimation Analysis

Lin [133] used ordinary least squares (OLS) regression when explaining firm performance with Tobin’s Q along with another financial performance indicator. Because we also used Tobin’s Q to indicate a firm’s financial performance, we adopted ordinary least squares (OLS) regression to confirm our five hypotheses. We analyzed them by adopting multiple linear regression, since we included four different moderating variables, such as the payment method of cash, past CBMA experience, the amount of the target’s strategic assets, and whether the target firm belonged to a high-tech industry, interacting with R&D intensity that influences Tobin’s Q.

\[ Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 Interactions + \epsilon_i \]

where \( Y_i \) = Tobin’s Q, \( \beta_0 \) = a constant, \( X_1 \) = independent variables, and \( X_2 \) = control variables.

In order to reconfirm the sample selection bias that might occur in OLS regression, we performed an additional analysis with propensity-score matching (PSM) and the Heckman selection model after the samples were classified into domestic M&A and CBMA. Details about the robustness test will be covered in the next section. It has been known that PSM can make an estimation more similar to the result generated when the treatment is random than general regression analysis. The Heckman selection model is a method of model estimation by dividing the stage into Stage 1 and Stage 2. First, we considered selection as a binary probit model in Step 1 and regression analysis in Step 2. In this case, when the regression analysis in Step 2 is performed, an error correction term called IMR (Invers Mill’s Ratio) is included. In the case of modeling for the case where the response is 1 in Step 1, pdf (z)/cdf(z) is used as the IMR and included in the model as a control variable.

4. Results

4.1. Descriptive Statistics

Table 1 shows the basic statistics, such as mean and standard deviation, for the samples used in this study. Before we investigated the correlation analysis, the characteristics of each variable were largely divided into whether it was a domestic M&A or CBMA. This division was pre-configured for propensity-score matching and the Heckman selection model. In the case of a domestic M&A, we extracted a wider sample so that the CBMA between the developed countries that we focused on could be matched. For all variables used for hypothesis verification, we performed t-tests by designating CBMA as a binary variable; the values are shown in the rightmost column. Among the variables, all the variables except A_Age, A_M&Aexp_3YR, T_HighTech, A_HighTech, and Relatedness showed significant differences (\( p < 0.05 \)).
Table 1. Mean, standard deviation, and t-test.

| Variables                  | Domestic M&A (n = 325) | CBMA (n = 141) | Difference |
|----------------------------|------------------------|----------------|------------|
|                            | Mean       | SD          | Mean       | SD          |            |
| A\_Tobin's\_Q\_3YR        | 1.37       | 0.91        | 1.57       | 1.22        | -0.20*     |
| ln\_size                  | 8.32       | 2.08        | 7.39       | 2.16        | 0.93*      |
| A\_ROA                    | 0.04       | 0.15        | -0.01      | 0.38        | 0.06*      |
| A\_Age                    | 52.80      | 45.40       | 49.60      | 49.20       | 3.29       |
| Deal\_Duration            | 105.00     | 80.90       | 89.00      | 80.50       | 15.99*     |
| ln\_dealvalue             | 5.88       | 1.85        | 5.16       | 2.00        | 0.73*      |
| A\_M&Aexp\_3YR            | 2.66       | 3.06        | 2.69       | 4.48        | -0.04      |
| A\_HighTech               | 0.63       | 0.48        | 0.62       | 0.49        | 0.02       |
| Relatedness               | 0.68       | 0.47        | 0.74       | 0.44        | -0.06      |
| T\_HighTech               | 0.67       | 0.47        | 0.58       | 0.49        | 0.08*      |
| Cash payment              | 0.71       | 0.45        | 0.48       | 0.50        | 0.24*      |
| ln\_intangible            | 3.64       | 2.46        | 2.84       | 2.77        | 0.80*      |
| A\_R&Dintensity           | 0.12       | 0.21        | 0.25       | 0.98        | -0.13*     |

Note: * p < 0.05; A\_ = Acquirer, T\_ = Target, ln\_ = Logged; A\_Tobin's\_Q\_3YR = 3 years of post-merger Tobin's Q, A\_M&Aexp\_3YR = 3 years of past CBMA experience, ln\_intangible = strategic assets.

To reduce the sample selection bias, we used PSM and adopted Heckman's two-stage model to reconfirm the result of PSM and tried to reduce errors caused by bias after OLS regression. To match the samples, we obtained the following results using the “psmatch2” syntax in STATA 16. That is, out of 465 samples, the sample corresponding to support was matched, and finally, we performed probit for 461 samples. By means of this, we analyzed the significance of the average treatment effect (ATT) for post-M&A performance for the sample matched around the calculated propensity score. According to the results of measuring the ATT for post-M&A performance in Table 2, we found significant results for all matching methods except for Radius matching.

Table 2. Matching estimates for average treatment effects on the treated (ATT).

| Matching Method | Treated | Controls | Difference | T-Value |
|-----------------|---------|----------|------------|---------|
| Nearest         | 1.53    | 1.26     | 0.264      | 2.04    |
| Kernel          | 1.53    | 1.29     | 0.237      | 1.88    |
| Radius          | 1.53    | 1.36     | 0.168      | 1.60    |
| Mahalanobis     | 1.53    | 0.85     | 0.681      | 3.48    |

In Table 3, we outline the correlation matrix to summarize the correlations between independent variables within the analyzed dataset. Most of the coefficient values between the explanatory variables range from 0.00 to 0.62. The matrix illustrates that the magnitude of the correlations is of either a low or moderate degree, which is reasonable. However, some exceptions do exist. The coefficients between ln\_dealvalue and ln\_size, A\_ROA and A\_R&Dintensity, and A\_HighTech and T\_HighTech show correlation values above 0.50, which denotes a rather high degree of correlation. Although few correlations represent strong relationships, we also performed a variance inflation factor (VIF) test in order to examine the presence of multicollinearity and the reliability of the linear regression, since we used OLS regression for the estimation analysis. After the VIF test, it turned out that the value ranged from 1.13 to 2.43. Since the cutoffs for the VIFs are less than 10, the model appeared less likely to suffer from multicollinearity issues [134], which are thus not a concern [135] for the current study.
we depict each interaction term in Figures 1–4. Furthermore, the variables adopted for interaction terms were mean-centered before we performed the analysis [137].

Table 3. Descriptive statistics and correlation matrix.

| Variables            | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  |
|----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| A_Tobin’sQ_3YR       | 1.00|     |     |     |     |     |     |     |     |     |     |     |     |
| ln_Size              | −0.14| 1.00|     |     |     |     |     |     |     |     |     |     |     |
| A_ROA                | 0.05| 0.27| 1.00|     |     |     |     |     |     |     |     |     |     |
| A_Age                | −0.28| 0.48| 0.15| 1.00|     |     |     |     |     |     |     |     |     |
| Deal_Dealuration     | −0.08| 0.03| 0.05| 0.06| 1.00|     |     |     |     |     |     |     |     |
| ln_Dealvalue         | −0.08| 0.62| 0.29| 0.28| 0.49| 1.00|     |     |     |     |     |     |     |
| A_M&Aexp_3YR         | 0.07| 0.29| 0.14| 0.04| −0.02| 0.19| 1.00|     |     |     |     |     |     |
| A_HighTech           | 0.32| −0.25| −0.12| −0.39| 0.07| −0.01| 0.09| 1.00|     |     |     |     |     |
| T_HighTech           | 0.07| −0.12| −0.06| −0.30| 0.13| 0.13| 0.05| 0.53| 1.00|     |     |     |     |
| Cash Payment         | 0.12| 0.09| 0.16| 0.05| 0.04| 0.04| 0.00| −0.08| −0.05| 1.00|     |     |     |
| Language             | 0.16| 0.09| 0.06| 0.06| 0.28| 0.04| −0.15| 0.09| −0.15| −0.13| 1.00|     |     |
| Relatedness          | −0.10| −0.13| 0.21| 0.07| −0.08| 0.02| −0.08| −0.01| 0.05| 0.13| −0.11| 1.00|     |
| ln_Intangible        | −0.09| 0.33| 0.08| 0.18| 0.20| 0.35| 0.03| 0.01| 0.03| −0.04| 0.06| 0.06| 1.00|
| A_R&DIntensity       | 0.15| −0.24| −0.53| −0.24| −0.07| −0.14| −0.07| 0.25| 0.21| −0.10| −0.06| 0.00| −0.18|

Note: * p < 0.05; A_ = Acquirer, T_ = Target, ln_ = Logged; A_Tobin’sQ_3YR = 3 years of post-merger Tobin’s Q; A_M&Aexp_3YR = 3 years of past CBMA experience, ln_intangible = strategic assets.

4.2. OLS Regression

We examined a total of six models to test the hypotheses, as shown in Table 4. Model 1 is a direct-effect model that includes Tobin’s Q regressed with control variables, moderators, and the predictor variable. Models 2 to 5 constitute the moderating-effect models for Tobin’s Q, comprising the addition of an interaction term of A_R&DIntensity and the M&Aexp_3YR, Cash payment, ln_intangible, and T_HighTech, respectively. Finally, we regressed Model 6, the full model, on all the explanatory variables and interaction terms used in the analysis. Especially among the control variables, we controlled each acquisition year from 2001 to 2014 in order to rule out general longitudinal trends and unobserved time-specific heterogeneity effects [127,136]. For the moderating effects, we depict each interaction term in Figures 1–4. Furthermore, the variables adopted for interaction terms were mean-centered before we performed the analysis [137].

H1 states that the acquirer’s absorptive capacity is positively related to its post-merger performance. The coefficient ($\beta = 0.351$) for the A_R&DIntensity in Model 1 is positively significant with Tobin’s Q ($p < 0.001$), and its significant effect was confirmed with all the other models ($p < 0.001$ in Models 3–5; $p < 0.05$ in Model 6) except for Model 2, where the coefficient of A_R&DIntensity becomes insignificant. Hence, H1 is supported, denoting that a higher absorptive capacity of acquiring firms leads to better post-merger performance. H2 predicted that an acquiring firm’s payment by cash increases the positive effect of the acquirer’s absorptive capacity on post-merger performance. The coefficient for the interaction term between A_R&DIntensity and Cash payment in Model 3 is positively significant with Tobin’s Q ($\beta = 1.129, p < 0.001$). However, in Model 6, it becomes negatively insignificant. In Figure 2, we have plotted the interaction effect between A_R&DIntensity and cash. As can be seen from the plot, the steeper slope indicates that a cash payment by the acquiring firm denotes that the cash payment has a stronger positive effect on the relationship between the acquiring firm’s absorptive capacity and the post-merger performance. Therefore, H2 is supported. For H3, we contemplated that the acquiring firm’s previous M&A experience increased the positive effect of the acquirer’s absorptive capacity on post-merger performance. The coefficient for the interaction term between A_R&DIntensity and A_M&Aexp_3YR in Model 2 is positively significant with Tobin’s Q ($\beta = 0.308, p < 0.01$), and its effect becomes marginally significant in Model 6. By looking at the interaction effect between A_R&DIntensity and A_M&Aexp_3YR in Figure 1, a steeper slope between Tobin’s Q and Acquirer’s R&D Intensity suggests that A_M&Aexp_3YR has a stronger positive effect on the post-merger performance of an acquiring firm. Thus, H3 is supported. In H4, we asserted that the possession of strategic assets by the target firm bolsters the positive effect of the acquirer’s absorptive capacity on post-merger performance. The coefficient ($\beta = 0.415$ in Model 4; $\beta = 0.311$ in Model 6) of the interaction term between A_R&DIntensity and ln_intangible is positively significant with Tobin’s Q in all models that include this interaction term ($p < 0.001$). Moreover, as can be seen from Figure 4, the positive interaction effect between A_R&DIntensity and ln_intangible becomes...
stronger, showing a positive effect on Tobin’s Q. Consequently, H4 is supported, suggesting that, compared to firms that hold low strategic assets, firms with better strategic assets tend to increase the acquirer’s post-merger performance. Last, in H5, we conjectured that if the target firm is in a high-tech industry, such a circumstance decreases the positive effect of the acquirer’s absorptive capacity on post-merger performance. The coefficient ($\beta = 2.787$) for the interaction term between A_R&Dintensity and T_HighTech in Model 5 is negatively significant with Tobin’s Q ($p < 0.001$), as it also is in Model 6 ($p < 0.05$). Based on Figure 4, a weaker slope between Tobin’s Q and Acquirer’s R&D Intensity for firms in a high-tech industry suggests that T_HighTech has less effect on the post-merger performance of an acquiring firm. Hence, H5 is supported.

### Table 4. Results of ordinary least squares (OLS) regression on Tobin’s Q.

| Variables                  | Model 1       | Model 2       | Model 3       | Model 4       | Model 5       | Model 6       |
|----------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Year Dummies               | Yes           | Yes           | Yes           | Yes           | Yes           | Yes           |
| ln_Size                    | –0.02†        | –0.02         | –0.017        | –0.003        | –0.001        | 0.001         |
|                            | (–0.67)       | (–0.71)       | (–0.55)       | (–0.10)       | (–0.02)       | (0.04)        |
| A_ROA                      | 0.351†        | 0.395*        | 0.414*        | 0.480*        | 0.439*        | 0.506**       |
|                            | (1.77)        | (1.99)        | (2.10)        | (2.50)        | (2.27)        | (2.65)        |
| A_Age                      | –0.002        | –0.002        | –0.001        | –0.001        | –0.001        | –0.001        |
|                            | (–1.49)       | (–1.45)       | (–1.15)       | (–1.21)       | (–1.08)       | (–1.12)       |
| Deal_Duration              | –0.001†       | –0.001†       | –0.001†       | –0.001†       | –0.001†       | –0.001†       |
|                            | (–2.04)       | (–2.13)       | (–1.84)       | (–1.62)       | (–1.73)       | (–1.68)       |
| ln_Dealvalue               | 0.076†        | 0.077†        | 0.069†        | 0.062†        | 0.061†        | 0.061†        |
|                            | (2.12)        | (2.17)        | (1.94)        | (1.81)        | (1.76)        | (1.78)        |
| A_M&Aexp_3YR               | 0.018         | –0.028        | 0.016         | 0.020         | 0.015         | –0.014        |
|                            | (1.29)        | (–1.32)       | (1.35)        | (1.48)        | (1.14)        | (–0.64)       |
| A_HighTech                 | 0.477***      | 0.462***      | 0.410**       | 0.326**       | 0.396**       | 0.330**       |
|                            | (3.78)        | (3.68)        | (3.24)        | (2.65)        | (3.21)        | (2.68)        |
| T_HighTech                 | –0.248*       | –0.240†       | –0.223†       | –0.221†       | 0.017         | –0.091        |
|                            | (–1.97)       | (–1.92)       | (–1.79)       | (–1.83)       | (0.13)        | (–0.68)       |
| Cash Payment               | 0.222         | 0.213         | 0.081         | 0.203*        | 0.172†        | 0.215†        |
|                            | (2.10)        | (2.03)        | (0.72)        | (2.01)        | (1.68)        | (1.94)        |
| Language                   | 0.100†        | 0.089         | 0.101†        | 0.085         | 0.086         | 0.074         |
|                            | (1.83)        | (1.64)        | (1.87)        | (1.62)        | (1.63)        | (1.41)        |
| Relatedness                | 0.027         | 0.005         | 0.029         | 0.063         | 0.093         | 0.073         |
|                            | (0.27)        | (0.05)        | (0.29)        | (0.65)        | (0.95)        | (0.75)        |
| ln_Intangible              | –0.019        | –0.016        | –0.016        | –0.067**      | –0.023        | –0.056*       |
|                            | (–0.89)       | (–0.77)       | (–0.79)       | (–3.09)       | (–1.11)       | (–2.52)       |
| A_R&Dintensity             | 0.351***      | 0.077         | 0.308***      | 0.339***      | 0.308***      | 1.592*†       |
|                            | (4.30)        | (0.60)        | (3.78)        | (4.34)        | (6.09)        | (2.29)        |
| A_R&Dintensity × A_M&Aexp_3YR | 0.308**    |                          | 0.308**      |                          | 0.211†        | (2.79)        |
|                            |                          |                          | (3.31)       |                          | (1.84)        | (3.31)        |
| A_R&Dintensity × Cash payment | 1.129***    |                          | 0.415***      |                          | 0.311***       | (3.62)        |
|                            |                          |                          | (6.32)       |                          | (3.82)        | (3.62)        |
| A_R&Dintensity × ln_intangible | 0.451***    |                          | 0.451***      |                          | 0.451***       | (5.46)        |
|                            |                          |                          | (6.32)       |                          | (5.46)        | (5.46)        |
| A_R&Dintensity × T_HighTech | –2.787***    |                          | –1.456*       |                          | –1.456*       | (2.11)        |
|                            |                          |                          | (–5.46)      |                          | (–5.46)       | (–5.46)       |
| Constant                   | 0.716*         | 0.846**        | 0.733*        | 0.649*         | 0.455         | 0.614*        |
|                            | (2.44)         | (2.87)         | (2.53)        | (2.31)         | (1.58)        | (2.12)        |
| Observations               | 141            | 141            | 141           | 141           | 141           | 141           |
| R²                         | 0.186          | 0.200          | 0.206         | 0.254         | 0.238         | 0.268         |
| Adjusted R²                | 0.133          | 0.147          | 0.153         | 0.204         | 0.187         | 0.214         |
| Log-likelihood             | –622.535       | –618.421       | –616.740      | –602.133      | –607.115      | –597.627      |
|                            | 3.551***       | 3.749***       | 3.885***      | 5.110***      | 4.694***      | 4.953***       |
| df(m)                      | 28             | 29             | 29            | 29            | 29            | 32            |

Note: t-statistics in parentheses; † $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, A_ = Acquirer, T_ = Target, ln_ = Logged; A_Tobin’sQ_3YR = 3 years of post-merger Tobin’s Q; A_M&Aexp_3YR = 3 years of past CBMA experience, ln_intangible = strategic assets.
4.3. Robustness Test: Heckman Selection Model

As mentioned above, we assumed that domestic M&A and CBMA, as treatments, could cause selection bias. In order to additionally measure the bias, we introduced the Heckman selection model.
This method is almost identical to the PSM, but with some differences. The Heckman method proceeds in the order of calculating lambda by analyzing probit for the selection and then inputting lambda as IMR to each model to correct errors that may be caused by the selection. If lambda is not significant, the model can be judged as having no bias. According to Table 5, since lambda was insignificant, this analysis showed that bias was no longer an issue. According to the estimation results, most of the variables showed result values similar to those when this study was verified with OLS. Perhaps it can be interpreted that the problem of selection bias caused by unobserved errors in the selection of CBMA and domestic M&A is not great.

Table 5. Heckman selection model for post-M&A performance.

| Variables                                      | Model 7            |
|------------------------------------------------|--------------------|
| Year Dummy                                     | Yes                |
| ln_size                                        | 0.03 (0.77)        |
| A_ROA                                          | 1.68 ** (2.63)     |
| A_Age                                          | 0.00 (0.97)        |
| Deal_Duration                                  | −0.00 (−0.60)      |
| ln_Dealvalue                                    | −0.23 (−1.48)      |
| A_M&Aexp_3YR                                   | −0.02 (−0.85)      |
| A_HighTech                                     | 0.40 ** (3.14)     |
| T_HighTech                                     | −0.36 (−1.87)      |
| Cash Payment                                   | 0.23 * (2.09)      |
| Language                                       | 0.05 (1.32)        |
| Relatedness                                    | 0.06 (0.61)        |
| ln_Intangible                                  | 0.07 (1.02)        |
| A_R&Dintensity                                 | 1.73 * (2.49)      |
| A_R&Dintensity × A_M&Aexp_3YR                  | 0.21 (1.87)        |
| A_R&Dintensity × Cash Payment                  | −0.34 (−0.79)      |
| A_R&Dintensity × ln_intangible                 | 0.30 *** (3.73)    |
| A_R&Dintensity × T_HighTech                    | −1.56 * (−2.26)    |
| Constant                                       | −0.20 (−0.39)      |
| Lambda                                         | 1.10 (1.94)        |
| Observations                                   | 465                |
| $R^2$                                          | 0.274              |
| Adjusted $R^2$                                 | 0.221              |
| Log Likelihood                                 | −595.70            |
| $F$                                            | 5.11 ***           |
| Df(m)                                          | 32                 |
| AIC                                            | 1257.40            |
| BIC                                            | 1394.08            |

Note: $t$ statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; A_ = Acquirer, T_ = Target, ln_ = Logged; A_Tobin’sQ_3YR = 3 years of post-merger Tobin’s $Q$, A_M&Aexp_3YR = 3 years of past CBMA experience, ln_intangible = strategic assets.

4.4. Sensitivity Test: Domestic M&A vs. CBMA

Because Lin, Peng, Yang and Sun [63] compared the moderating effects of institutional development on M&A in two countries, China and the United States, we classified A_R&Dintensity, ln_intangible, cash payment, and T_HighTech into domestic and overseas comparisons and verified all the effects while the other variables were controlled for. In Table 6, A_R&Dintensity was slightly stronger in CBMA ($β = 2.92, p < 0.001$) than domestic M&A ($β = 0.31, p < 0.001$). In other words, when the acquired company acquires a target firm located overseas, the effect of absorptive capacity on Tobin’s $Q$ is more reactive. Thus, when a firm is investing by means of M&As, a high level of the acquirer’s absorptive capacity is more positively related to post-merger performance in CBMA than in domestic M&A.
### Table 6. Comparison test comparing domestic M&As and CBMAs.

| Variables                  | Model 8 (Domestic M&A) | Model 9 (CBMA) |
|----------------------------|------------------------|----------------|
| (Context)                 |                        |                |
| Year Dummy                | Yes                    | Yes            |
| ln_Size                   | −0.00 (−0.09)          | −0.01 (−0.20)  |
| A_ROA                     | 1.19 *** (4.23)        | 1.96 ** (2.92) |
| A_Age                     | −0.00 (−0.04)          | −0.00 (−1.14)  |
| Deal_Duration             | −0.00 (−1.69)          | −0.00 (−1.03)  |
| ln_Dealvalue              | 0.07 (1.37)            | 0.05 (0.85)    |
| A_M&Aexp_3YR             | −0.01 (−0.80)          | 0.02 (0.75)    |
| A_HighTech                | 0.40 *** (3.54)        | 0.26 * (2.05)  |
| T_HighTech                | −0.04 (−0.30)          | −0.10 (−0.79)  |
| Cash Payment              | 0.06 (0.71)            | 0.17 (1.65)    |
| Relatedness               | 0.26 ** (3.17)         | −0.10 (−0.85)  |
| ln_Intangible             | −0.03 (−1.08)          | −0.02 (−0.50)  |
| A_R&Dintensity           | 0.31 *** (5.26)        | 2.92 *** (4.04) |
| Constant                  | 0.65 ** (3.02)         | 0.99 ** (3.30) |
| Lambda                    | −0.10 (−0.66)          | −0.32 (−1.28)  |

Observations 325 141

R² 0.233 0.331

Adjusted R² 0.201 0.262

F 7.21 *** 4.79 ***

Df(m) 13 13

Note: t statistics in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001; A_ = Acquirer, T_ = Target, ln_ = Logged; A_Tobin’sQ_3YR = 3 years of post-merger Tobin’s Q, A_M&Aexp_3YR = 3 years of past CBMA experience, ln_intangible = strategic assets.

5. Conclusions

Although it is quite challenging to pinpoint the success factors pertaining to CBMAs, we argue that an acquiring firm’s absorptive capacity can be a crucial aspect when clarifying the possibility of achievements via CBMA and a firm’s sustainable performance. In such a respect, our study contributes to current M&A literature by highlighting the importance of a firm’s absorptive capacity for post-merger performance in terms of CBMAs [65–68] and how firms could achieve CBMA sustainability via better outcomes [10]. Such implications might be decisive, since the subject of sustainability in M&A is complementary to a firm’s financial performance and is receiving increased attention in M&A literature [3]. Additionally, a firm’s financial performance pertaining to M&A is highly related to the economic pillar of sustainability [3]. Comparing the different effects of absorptive capacity between domestic M&A and CBMA is another criterion that this study further contributes to the M&A literature. Measuring the effects of domestic M&A and CBMA is quite vague [21], and comparative studies on such an issue are rare. Following the concept implemented by Lin, Peng, Yang and Sun [63], we tried to fill this gap by investigating the different significance of absorptive capacity for an acquiring firm’s post-merger performance between domestic M&A and CBMA. By analyzing two transactions, we found that a high level of acquirer’s absorptive capacity was more positively related to post-merger performance in CBMA transactions than in domestic M&A. Such a result could be explained in terms of why a firm engages in CBMA, since they are motivated to acquire firms overseas that possess resources and intelligence that are not available domestically and to discover novel opportunities for further growth [21]. From the firm’s realized absorptive capacity perspective, we assert that firms in developed countries are well-fitted to exploit external knowledge resources, and thus, the post-merger performance would be intensified when absorbing new external knowledge that is acquired from other developed countries. Moreover, we extended the significance of realized absorptive capacity [24] by consolidating a firm’s strategic behavior and the characteristics of the target firm’s knowledge to demonstrate how such aspects affect the relationship between the acquirer’s absorptive capacity
and post-merger performance. In such a regard, we introduced four moderators that could influence the main effect by either improving or hindering a firm’s CBMA sustainability.

From the perspective of the acquirer, the first two variables, cash payment and prior CBMA experience, were considered to be characteristics of an acquiring firm’s strategic behavior. Firms would be motivated to seek new opportunities to take advantage of knowledge-based discoveries by means of precise decisions in order to sustain their business \cite{75,76}. In order to achieve CBMA sustainability, the chief of the firm would select the best strategic option by means of rational consideration in the process of acquiring the target firm. In such a viewpoint, if acquiring firms are eagerly motivated to capitalize on a specific target company’s knowledge resources, firms would carry out CBMA via cash payment in order to win against rivals, since such a transaction is preferred by the target firms and lowers the complexity of the deal process \cite{80,85}. Furthermore, prior CBMA experience could lead firms to learn from the past, which would bring insights for firms in choosing the essential knowledge to combine \cite{91,94}.

As for a target’s knowledge, we related a target firm’s external knowledge as a synergy-creation method for a firm’s CBMA sustainability \cite{77,78}. We characterized a target firm’s external knowledge into the amount of a target firm’s strategic assets that they hold and the industry they reside in, especially a high-tech industry. As mentioned before, firms might not have the necessary strategic assets for promoting further growth. If this is the case, we contend that the amount of the target’s knowledge would further enable firms to achieve CBMA sustainability via increased post-merger performance, since firms may become motivated to acquire a target firm’s external strategic assets by transferring by means of CBMAs \cite{40,73}. Moreover, we found that when the acquired knowledge is related to a high-tech industry, a firm’s CBMA sustainability becomes worse. This might imply that issues such as path dependency and resource redundancy from high-tech knowledge could deter an acquirer from improving its post-merger performance.

We concluded that a deal via cash payment is more sustainable in the CBMA context. However, some studies disagree with the cash-payment preference and support other types of payment in M&A transactions. Prior literature has stated that in certain circumstances, stock payment could be a more attractive payment method than cash payment is. For instance, for stock payment, acquiring firms could have advantages in monitoring capability with the support of shareholders from the local area \cite{138} and reducing the risks from knowledge asymmetry \cite{84}. Contradicting suggestions for different payment methods in CBMA may imply that an acquiring firm should choose the most optimal method to eliminate its vulnerability.

Our finding that an acquiring firm’s past CBMA experience positively influences its performance is consistent with prior literature \cite{92,93,95}. A firm’s CBMA experience increases its ability to choose the most needed knowledge, which is similar to domestic M&A experience \cite{70}. This experience goes far beyond simply obtaining new knowledge. Throughout the CBMA experience, a firm could gain insight into how to deal with foreign country-level difficulties \cite{81}, including culture clash \cite{74,96}. Moreover, such experience enlarges a firm’s evaluation level toward understanding target firm assets \cite{57}. Our empirical evidence may strengthen the implications of past studies that describe the positive effect of prior experience on CBMA sustainability.

Related to a target firm’s strategic assets, our findings are also consistent with past studies highlighting the positive relationship between the amount of a target firm’s strategic assets and firm performance. Prior studies explained that a firm could be sustainable if they possessed the necessary strategic assets \cite{82,106}. This can also be applied in the CBMA context. As target firms possess needed strategic assets, an acquiring firm could turn its unique resources into firm value. This is well demonstrated by Deng \cite{40}, that, especially, the advanced knowledge of firms from developed countries leads to high sustainability for an acquiring firm by means of allowing them to exploit new strategic assets. In addition, the more strategic assets a target firm possesses, the more an acquiring firm could apply and create synergy with their internal values \cite{107}. Therefore, our study highlights
the positive relationship between the amount of a target's strategic asset and an acquirer’s sustainability by means of empirical evidence.

Our findings related to high-tech industries may contradict some literature proposing that high-tech targets have a positive effect on firms. For instance, Tarba, et al. [139] stated that when both acquiring and target firms belong to a high-tech industry, that would create synergistic value by combining knowledge because of their complementary fit. In addition, related to a firm’s innovative performance, studies illustrate a positive outcome from acquisition [78,79]. In this context, our finding would be meaningful in two ways. First, since we cover the overall industries of acquiring firms and focus on CBMA sustainability by means of a firm’s post-merger performance, our study implies that a complementary fit from high-tech knowledge should require more effort for non-high-tech acquiring firms. Second, innovation by means of acquiring a high-tech firm may need further commercialization by means of marketing, to create a positive financial outcome [140].

5.1. Theoretical Implications

First, we observed the relationship between a firm’s absorptive capacity and post-merger performance in the CBMA context by explaining via a knowledge-based view. We found that existing literature on absorptive capacity and firm performance with CBMAs were much less focused on a firm’s post-merger performance. Despite prior literature touching on absorptive capacity in post-merger performance, many studies have highlighted investment from developing countries in developed countries [73,92] for advanced knowledge. However, we argue that firms from developed countries also have strong motivations to acquire foreign firms for unknown and complementary knowledge. From this view, we found the importance of differentiating developed from developing nations, since the firms from the former countries would have more benefit from exploiting knowledge assets because of having better realized absorptive capacity than the latter [71]. Additionally, by analyzing two similar but very different transactions, namely, domestic M&A and CBMA, we emphasize the importance of CBMA when firms try to find new opportunities for future growth from the perspective of absorptive capacity. It is possible that firms engaging in CBMA could promote better post-merger performance by acquiring assets and knowledge that are not available from the domestic market, which could further increase the positive effect of absorptive capacity on a firm’s post-merger performance. Thus, our study contributes toward both the CBMA and CBMA sustainability contexts by highlighting the transactions between developed countries that are motivated to acquire new knowledge and to increase post-merger performance.

Second, existing literature on CBMAs is more inclined toward explaining the phenomenon by concentrating only on either side [8,29,30,74]. We considered that prior studies focusing only on one side may neglect the effect of the other side. Therefore, our study contributes to filling this gap by broadening the current scope of CBMA by building upon the characteristics of both strategic behavior and the target firm’s knowledge features, which may have different effects on a firm’s CBMA sustainability. More specifically, we differentiated that into four different moderators: cash payment, prior CBMA experience, the amount of strategic assets, and high-tech industry. By exploring dichotomized perspectives, our study contributes toward future studies to observe broader perspectives of CBMAs as a whole.

5.2. Managerial Implications

González-Torres, Rodríguez-Sánchez, Pelechano-Barahona and García-Muiña [3] stated that the notion of sustainability is strongly related to mergers and financial performance. This implies that fostering sustainable practices to improve a firm’s long-term competitive advantage is crucial for bolstering financial performance [3] to achieve CBMA sustainability. Accordingly, we revisited the fundamental mechanism of both the knowledge-based view and absorptive capacity to better understand how firms could achieve CBMA sustainability via superior post-merger performance. In a knowledge-based view, the firm is viewed as an agglomeration of knowledge and intangible
That is, knowledge should be regarded as a hereditary factor in order for firms to preserve their sustainability [44] and apply sustainability management tools [141]. In such regard, for practitioners, further improving what and how much of the knowledge asset that the firm captures should be regarded as an essential factor for a firm’s CBMA sustainability, because the increased accumulation of knowledge creates an opportunity for firms to achieve further growth [142,143]. In addition, theories of absorptive capacity also state that firms are inclined towards bolstering their competitiveness via absorbing external strategic assets. In this line of reasoning, we could fathom how much the idiosyncratic resources that the target firm holds could have a decisive effect on acquiring a firm’s CBMA sustainability.

However, our main argument and empirical results denote that not only the target firm but also the acquiring firm matters with respect to absorptive capacity. Such an implication is noteworthy for practitioners, since absorptive capacity requires all four steps of “acquisition, assimilation, transformation, and exploitation” [24] that should be undertaken by the acquiring firms. That is, for acquiring firms, simply acquiring external knowledge is not enough to increase absorptive capacity, but they need to build an internal mechanism of combinative capabilities to incorporate and amass external knowledge [25,28]. As our main result indicates, acquiring firms with better absorptive capacity have greater post-merger performance. Such an implication denotes that it requires practitioners to acknowledge and evaluate the competency of a firm’s own absorptive capacity in order to properly incorporate acquired knowledge assets, which would ultimately lead to achieving CBMA sustainability. Thus, we contend that when acquiring firms assess potential CBMA deals, a comprehensive understanding of their own absorptive capacity before the transaction is essential for realizing lucrative post-merger performance.

With regard to an acquiring firm’s internal strategic behavior, we found that payment with cash further strengthens the positive relationship between an acquiring firm’s absorptive capacity and post-merger performance. We comprehend that lowering the complexity and duration of the deal is a virtue when it comes to successful deal evaluation, because M&A transactions, especially acquisitions between different countries, can entail various issues, such as unknown culture [48,49], different languages [51], and the liability of foreignness [55]. In order to reduce the overall effects of the above-mentioned issues, we consider that mitigating the hardship induced by such complications is essential for achieving a firm’s CBMA sustainability. Hence, we suggest that practitioners ought to employ cash payment when entering CBMA deals, since cash payment is a reliable means for acquiring firms to win against rivals and it could shorten the overall deal duration, since other methods, such as stock payment, could lengthen the duration when the deal is complicated [80]. Besides, we found that the amount of experience matters. The result itself might not be surprising. However, it is notable to mention that CBMA is a complex transaction, as mentioned above. Previous experience later brings know-how to the firm for combining external knowledge more efficiently [92,93] and creates a mechanism that allows firms to become sensitive to cultural differences [74]. Additionally, such a routine prevents unnecessary procedures [81], brings insight for firms to be able to recognize knowledge assets that need to be combined [95], and enables firms to obtain organizational experience (e.g., target selection, due diligence and valuation, negotiation skills, and post-M&A integration) [144]. Such experiences could have a profound positive effect on subsequent deals and post-merger performance. Therefore, we propose that practitioners should reiterate the importance of prior experience when it comes to CBMAs, since it aids firms in cultivating acquisition-specific capabilities [145].

For the target firm’s external knowledge assets, our result indicates that the amount of strategic assets held by the target firm is decisive for the acquiring firm. However, only using CBMA to gain access to strategic assets by indigenous firms would not always lead them to better post-merger performance [25], because strategic assets are often characterized as tacit, specific, and complex [99]. For such reasons, we recapitulate the importance of absorptive capacity as the primary virtue for CBMA sustainability. Practitioners should understand that in order for firms to maximize using the captured resources from CBMA, firms need to develop their knowledge and routines, namely, absorptive capacity [28], in order to streamline the process and overcome the distinct aspects of strategic assets.
Only then would firms be able to maximize the true potential of acquired strategic assets and increase the odds of achieving CBMA sustainability via increased post-merger performance. However, we found that acquired firms that operate in the high-tech industry experience less positive effects compared to the non-high-tech industries. Some practitioners would find such findings to be odd, since, in an industry where advanced technology and knowledge are a focal point for firms’ success, firms face difficulties when pushing forward their innovative performance in an isolated environment [146].

However, in a business setting, such as a high-tech industry, where the valuation of target firms becomes problematic, as the value of key resources (e.g., human capital and intangible assets) tends to be obscured, contingent payments could occur when acquiring high-tech firms [147], which could ultimately influence the post-merger performance. Furthermore, extrinsic knowledge itself may have no direct effect on a firm’s innovative performance [148], and it is also unclear whether innovative performance can directly lead to a firm’s prosperity [149], in our case, post-merger performance. Consequently, for practitioners, we postulate that rather than focusing on the short-term financial result, it would be more practical for firms to use CBMA as a means of rapidly filling the gap with more developed technological knowledge for CBMA sustainability, since high-tech firms need to discover novel knowledge faster than other industries must [108].

5.3. Limitations and Future Studies

Granting that our study brings a unique contribution toward sustainable performance by observing the relationship between an acquiring firm’s absorptive capacity and its CBMA sustainability, our suggestion is still somewhat limited and thus could offer opportunities for future studies to bring more fruitful insights for the CBMA literature. First, we limited the sample to acquisitions by US firms in other developed countries. We meticulously selected our sample data based on US acquisitions to reduce the vulnerability coming from a lack of data, and by conducting both propensity-score matching (PSM) and a post hoc robustness check using the Heckman selection model, we endeavored to minimize and control for any sample selection bias that might have occurred during the analysis. Nonetheless, further study could be conducted based on our research, since it is still open to debate whether firms from non-US developed countries would have outcomes similar to those for US firms, namely, the generalizability issue. Furthermore, it would be intriguing to conduct comparative studies to observe different effects of absorptive capacity for diverse transactions, such as domestic M&A and CBMA or developed and developing countries, by implementing a sensitivity test similar to that in this study. To better grasp a firm’s economic sustainability in terms of CBMA, we consider that future studies including firms from other OECD countries should also be conducted.

Second, among different business tactics for investing in cross-border transactions, we focused on CBMAs because of their efficiency for acquiring new knowledge. When external knowledge is more advanced, such as high-tech knowledge, CBMAs could be the best method for firms to use to absorb external knowledge. Still, a firm does not always invest overseas for progressive knowledge. For instance, a firm could invest for new markets or natural resources. In the process of investing overseas for different purposes, new knowledge is still needed, such as knowledge about a distinct culture. Therefore, we could consider using different business tactics, such as joint ventures or strategic alliances, which may be more suitable for different purposes.

Third, we find that measurements to indicate a firm’s absorptive capacity by means of R&D intensity need more study. Past studies still used a firm’s R&D intensity to explain the level of absorptive capacity, although some literature has argued that this indicator might be outdated and recommend that studies should use different measurements for a firm’s absorptive capacity [23,119]. Jiménez-Barrionuevo, García-Morales and Molina [119] indicated that several alternatives could be used such as the composition of four dimensions—acquisition, assimilation, transformation, and exploitation—of a firm’s absorptive capacity. For future studies, by using several other indicators explaining a firm’s absorptive capacity, we may able to explain absorptive capacity from more diverse
perspectives and observe how different approaches to absorptive capacity are demonstrated in terms of CBMA and how they affect a firm’s achievement of CBMA sustainability.

Fourth, sustainability is composed of three aspects: environmental, economic, and social [150]. Among those pillars, our study was limited to observing economic sustainability. It is mentioned in various studies that the concept of sustainably encompasses the above-mentioned pillars or dimensions [151–153]. For such a reason, future studies could be conducted based on examining all three components of sustainability in terms of CBMA, which could lead to fruitful findings that allow us to better comprehend the intertwining features of both sustainability and CBMA as a whole.

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