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The Role of Absorptive Capacity and Opportunity Capture in Latecomer Firms' Innovation Catch-up

Relevant literature tends to take innovation catch-up of emerging markets' latecomer firms almost for granted. However, not all catch-up efforts are successful and some of these firms remain stuck in catching-up or exit from the market.

In the search for explanations, this paper investigates the mediating effects of opportunity capture against those of technological innovation in the relationships with performance of single dimensions of absorptive capacity.

Hypotheses about the different ways in which absorptive capacity can be deployed are tested on data collected from 166 manufacturing firms in Guangdong Province (China).

Findings support a stronger mediation effect of opportunity capture between absorptive capacity dimensions and firm's performance than that of technological innovation.

By using bootstrapped multiple mediation analysis and a multi-dimensional operationalisation of absorptive capacity, the study provides evidence of the relationships investigated, sheds light on some of their unintended effects on latecomer firms' innovation catch-up and draws practical implications.

Keywords: Latecomer firms, catch-up strategies, opportunity capture, absorptive capacity, technology innovation, China.

Introduction

The recent bourgeoning of emerging markets' firms attracted the interest of researchers in catch-up processes and related strategies. Many firms in emerging economies are in fact latecomers, i.e. suffer from the competitive disadvantages of initially lacking technology and difficult market access (Hobday 1995; Mathews 2002). Because of these disadvantages they

must rely on low-wages, government support and borrowed, often mature, technology to enhance their competitiveness and eventually catch-up (Amsden, 1989).

More recent literature argues that incremental innovation and pure imitation, are the initial catch-up strategies for every latecomer firm (Li & Kozhikode 2008). In fact, the distance of these firms from the technological frontier makes their technology backlog and backwardness an inherent advantage in technology catching up (Gershenkron, 1962), since it generates a productivity gap that makes stronger and faster the potential for a rapid advance (Abramovitz, 1986). At the same time, because of knowledge asymmetries created by this distance, innovative technologies may not be a good deal for latecomers (Cho, Kim, & Rhee, 1998) at least at the beginning. Therefore, the imitation and the application of readily available, less advanced and expensive technologies, coupled with the costs lever turns to be a better strategy for latecomers' initial catching-up (Li & Kozhikode, 2008). Within these strategies, secondary innovation (Wu, Ma, & Xu, 2009) is a prime example of the ways in which these firms attempt at seizing windows of opportunities (Lee & Malerba, 2017; Perez & Soete, 1998) by building the necessary capabilities to address their competitive disadvantages.

Secondary innovation is defined as the specific innovation process that begins with technology acquisition from industrialised countries, and develops along the existing trajectories of acquired technologies, within the established technological paradigm (Wu et al. 2009). Akin to such concepts as creative imitation (Kim, 1997), market-oriented innovation (Liu, 2008) or secondary business model innovation (Wu, Ma, & Shi 2010), secondary innovation is here intended as encompassing all these and the other catch-up approaches associated to restricted innovation performances (e.g. Guan, Mok, Yam, Chin, & Pun, 2006; Drucker, 1985; Liu, 2008; Chen, Guo, Huang, & Zhu, 2011).

For this reason, although secondary innovation or the like are rational catch-up strategies for overcoming initial latecomers' competitive disadvantages, if they are not accompanied or led

by the development of own innovative technology and capabilities, over time the risks of being exposed to technological obsolesce and paradigm shifts increase (Wu et al., 2009). In fact, global technological frontiers may shift so quickly that best-practice technologies and capabilities can become outdated before they are fully transferred and learned (Westphal, 2002). In addition, the catch-up process is intrinsically self-limiting because of the shrinking productivity improvement opportunities inherent to the replacement of old technologies with new ones (Abramovitz, 1986). If we add that, since secondary innovations are engrained in the initial innovation process, they rarely lead to the development of new technological breakthroughs (Wu et al., 2009; Wu et al., 2010), the likeliness of an "aborted" catch-up (Lee & Malerba, 2017) is concrete. By this, the authors refer to a variation of the "standard" catch-up cycle in which firms fail to generate consistent gradual catch-up and get stuck somewhere at this stage.

However, other than these observations, catch-up appears almost as taken for granted in relevant literature and catch-up failure is portrayed at best as a risk (i.e. Wu et al., 2009) or a "deviation" (i.e. Lee & Malerba, 2017). Therefore, it is not surprising as only few authors enquired about the reasons for this second scenario. More specifically, Guan et al. (2006) and Li and Kozhikode (2008), analysing the Chinese context argued about, respectively, the weakness and the relevance of absorptive capacity. Later on, Lee and Malerba (2017) consistently point to the generic inability of a latecomer firm to learn and upgrade its capabilities as a determinant of aborted catch-up.

However, besides treating the role of absorptive capacity as an ancillary argument, the works above frames the issue within the traditional relationship between absorptive capacity and innovation, more precisely technological innovation. Although as earlier as 1994, Cohen and Levinthal argued that technological innovation is not the only way for firms to achieve the potential payoffs of absorptive capacity, being the ability to detect and capture technological

and market opportunities another outcome of absorptive capacity. Following this perspective, earlier works such as Deeds (2001), Li, Chen, Liu and Peng (2014) highlight the relevance of this second way of deploying absorptive capacity in emerging markets, where the significant structural turbulence and market transition that characterises latecomers' environment generates huge amounts of many rapidly evolving entrepreneurial opportunities. In such contexts they argue about how the ability to evaluate, better and faster, the use of imported technologies to promptly capture growth opportunities, referred as opportunity capture (Short, Ketchen, Shook, & Ireland, 2010) can be as good as, and even more profitable than, technological innovation. This is especially true if associated with incremental, market-driven adaptations of existing technologies (Petti & Zhang 2014) or disruptive technologies (Wu et al. 2010), which can be considered secondary innovation. This is our first assumption. The second is that, since opportunity capture may produce its benefits without needing significant technical transformations and thus requiring fewer resources, it has a stronger mediating effect with upstream, rather than with downstream, absorptive capacity dimensions.

To investigate these circumstances, we developed a conceptual model integrating an absorptive capacity perspective (Cohen & Levinthal, 1989; 1990) with an opportunity-based view (Shane & Venkatarman, 2000) to assess the mediating effects of opportunity capture against those of technological innovation in the relationships with performance of single dimensions of absorptive capacity. Should both assumptions hold true, opportunity capture might well be an alternative path, and a source of funds for latecomer firms' catching-up, provided in the meantime that the firms focus on transforming newly assimilated knowledge to develop own innovative technology.

Without this focus, the better performance effects of opportunity capturing may lead to impairing latecomer firms' long-term motivations to innovate, so as to eventually make it

difficult for them to complete their catch-up process. These are the main implications of our study.

The empirical analysis is carried out by testing a mediation model on a sample of 166 Chinese manufacturing firms in Guangdong Province. China is the leading Country and most bright example among emerging economies. In addition, it is the place where the secondary innovation concept first appeared in the literature, and where the more recent literature about latecomer firms concentrates (among others, Wu et al. 2010, Wu, Yu, & Wu, 2012). Within China, Guangdong is widely recognised as the Country's innovation leading province (Di Tommaso, Rubini, & Barbieri, 2012; Rubini & Barbieri 2013; Xu, Lin, & Lin, 2008).

This paper contributes to the existing literature in two main ways. Firstly, it clarifies the theoretical background about the mediating effects of both technological innovation and opportunity capture. Secondly, it enriches the debate about possible explanations to catch-up failure with empirical evidence about these relationships comparing these effects in the relationships between each dimension of absorptive capacity and performance. Additionally, it refers to a specific function of absorptive capacity, initially envisaged by Cohen and Levinthal (1994) as related to the increased ability to evaluate technology and market signals and its opportunities-related outcomes, seldom treated in relevant literature.

The remainder of this paper is structured as follows. The next section reviews the existing literature on latecomers' innovation, the roles of absorptive capacity and opportunity capture. It also describes the conceptual framework and the hypotheses developed. The paper then follows with the methodology and the results of the empirical analyses, while the last two sections discuss findings, limitations and future research lines.

Literature Review and Hypotheses

Latecomer Firms and Secondary Innovation

Following a resource-based perspective, latecomer firms' competitive disadvantages are attributed to an asymmetry in the resources needed to access their target markets (Hobday, 1995; Mathews, 2002). To fill this gap, secondary innovation based on the adaptation and/or re-localization of established technologies to produce "good enough" items and deliver new services appears particularly effective. Although earlier antecedents of secondary innovation can be tracked back to Drucker's (1985) conceptualization of creative imitation, the concept has become popular over the past twenty years and become associated with the East-Asian context (Kim, 1997, 1998; Wu et al., 2009, Wu et al., 2010).

Notwithstanding its diffusion, relevant literature seems to have underestimated its inherent and specific limitations. Although the same authors who brought the concept to scholars attention acutely observe that, since latecomers' advantage potential is higher with more mature technologies, they might not have time to create additional value before the acquired technologies become obsolete, falling into a vicious cycle of "*import-lag behind-import again"* (Wu et al., 2009, p. 391). This risk is not only consistent with Westphal (2002) concerns, but is also made more serious by Abramovitz's (1986) catch-up hypothesis. Therefore, catch-up is just one of the possible outcomes of catch-up strategies. Others are different degrees of catch-up failure: 1) innovation indolence, that is a firm's tendency to prefer acquisition and adaptation of existing technologies to its own technological innovation (Guan et al., 2006); 2) market exit (Li & Kozhikode, 2008).

In fact, according to a resource-based perspective, neither the few initial advantages latecomers can deploy, neither the resources they can initially acquire are particularly valuable, rare, inimitable and non-substitutable because of the asymmetry in knowledge levels with the providers of these resources.

The rise in scientific content of technology has partly solved this knowledge asymmetry making easier technology transfer and exploitation. Nonetheless, it has also made initial knowledge asymmetries more relevant, raising the need to harness this scientific content to face the exhaustion of acquired technologies opportunities through the development of in-house, higher level technology and technological development capabilities (Amsden, 1989; Lee & Malerba, 2017; Westphal, 2002; Wu et al., 2009).

This eventually leads to the role of organizational characteristics on the effectiveness of technology transfer. The key role in this regard has been attributed to absorptive capacity, by which Kedia and Baghat (1988) argued that a firm could make better use of technologies transferred and get better technologies to undertake its own technological developments.

Absorptive Capacity and its Outcomes

In the catch-up context, scholars tackled anecdotally absorptive capacity and usually adopted a "quantitative" perspective, in terms of its strength, intensity or relevance (e.g. Guan et al., 2006; Li & Kozhikode, 2008; Wu et al., 2009). However, the path-dependent nature of absorptive capacity upon knowledge accumulated in the past, self-reinforcing behaviours (Cohen & Levinthal, 1990), and patterns of inertia (Nelson & Winter, 1982) already offer explanations to why firms may become entrenched into initial technological paradigms and fail to catch-up, no matter how high their absorptive capacity is. In addition, it is neither uncommon nor theoretically puzzling to find firms with high levels of absorptive capacity associated with limited technological innovation.

Conversely, absorptive capacity is made of several knowledge processes or dimensions, with different functions and different relevance against technological innovation (Zahra & George, 2002). This conceptualization paves the way to that stream of literature that questions the 'monolithic' assumption of absorptive capacity (e.g., Jansen, Van den Bosch & Volberda.,

2005; Volberda, Foss & Marjorie, 2010) as a higher-order construct, in which dimensions are highly correlated, interchangeable and share common antecedents and outcomes. Zahra and George (2002) decompose absorptive capacity into knowledge acquisition, assimilation, transformation and exploitation and conceives each of the four dimensions as possibly having different outcomes. In particular, they attribute superior performance through technological innovation to those enterprises with well-developed knowledge transformation and exploitation processes, whereas they associate to well-developed knowledge acquisition and assimilation capabilities the achievement of competitive advantage through greater flexibility in reconfiguring their resource bases and in effectively timing capability deployment at lower costs.

As for latecomers, Guan et al. (2006) confirm and focus on the above assumptions by arguing that underinvestment in transformative capacity explains the insufficient ability to develop new technologies or paradigms. In fact, among the four dimensions, transformation is the key process to develop original and significant innovation since it is where new knowledge is actually created. Indeed, according to the resource-based perspective, transformation is of outmost importance in absorbing and integrating new rare, non-imitable and non-transferable knowledge with the existing one to generate new competencies (Zahra & George, 2002). Within this perspective, exploitation seems to be necessary but not sufficient for technology innovation, while it might be enough to generate economic performance. The barriers latecomers face lead them toward using those technologies that are least rare (e.g. mature technologies), easily imitable, and easily transferrable in the form of explicit knowledge (e.g. through technology consultancy) or readily usable embodied knowledge embedded in equipment or components (Mathews, 2002). Such technologies need fewer intensive efforts and shorter time to be assimilated and converted for internal use than radical new technologies or internal development.

Therefore, since the acquired technology is often applied directly for new processes or new products without significant change and conversion (Wu et al. 2010), transformation may not occur. In fact, external knowledge does not necessarily pass through all the steps (Grandinetti, 2016). However, in this latter case the outcome of exploitation (and of the whole absorption process) will just reflect the original nature of the knowledge acquired. In this scenario, it is still reasonable to expect that the latecomer will be able to achieve satisfactory, but not innovation-driven, economic performance in the short term (Franco, Marzucchi, & Montresor, 2014; Zahra & George, 2002).

The Mediating Role of Opportunity Capture

The above arguments lead to the assumption that technological innovation is not the only way for firms to achieve the potential performance payoffs of absorptive capacity.

Some studies consider the ability to detect and capture technological and market opportunities as another outcome of absorptive capacity (Deeds, 2001; Li et al. 2014). Cohen and Levinthal (1994) originally referred to this ability as a second, more subtle function of absorptive capacity, called *updating*, i.e. a better "ability to interpret often obscure technology and market signals" (p. 245) that "permits the firm to predict more accurately the nature of future technological advances and their commercial applications" (p. 229). This is an important aspect in Cohen and Levinthal's original theories that subsequent literature mostly neglected.

Deeds (2001), relying on those arguments, asserts that a firm with a well-developed knowledge base has a high absorptive capacity and is ready to "evaluate and act on any new information or ideas" (p. 33). Short et al. (2010) have discussed the concept of opportunity in a similar way, while Li et al. (2014) describe opportunity capture as "the pursuit and response to given opportunities quickly and utilizing them to achieve better firm growth" (p. 272). García-Sánchez, García-Morales and Martín-Rojas (2018) depict a mediation mechanism at

work by specifically referring to the potential of absorptive capacity (i.e. acquisition and assimilation) to improve significantly a firm's ability to recognise and exploit new opportunities, which in turn improves the ability to respond to a dynamic environment, providing the best conditions to translate entrepreneurial strategy into a greater performance.

These considerations are particularly relevant for the Chinese market, which has at least two relevant features: (a) remarkable width, making China an extraordinarily opportunity-rich environment; (b) rapid change and growth capacity, allowing the continuous emergence of short-term opportunities and market niches. In such environment opportunity capture, intended as the pursuit of both markets' and existing technologies' opportunities, i.e. through business model and secondary innovations (Wu et al., 2010, Wu et al., 2009) may be even more profitable than the pursuit of high-potential, technology-intensive opportunities through technological innovation (Petti & Zhang, 2014). The development of new technology to meet the existing or potential market needs, would require higher investment in downstream absorptive capacity processes (in particular transformation), which may limit the short-run performance, although remaining necessary to stay in the realm of long-term innovation catch-up. In fact, knowledge transformation and exploitation require laboratory experimentations, product design and prototype development (Nemanich, 2005) that not all latecomer firms may afford. Moreover, since knowledge transformation is a product of people's minds, it requires highly skilled employees, developed human resource policies and superior management capabilities that are able to attract, deploy and retain, let alone create such talents (Petti & Zhang, 2016). This is even a luxury for most of latecomer firms.

This leads to the following hypothesis:

H1. *In latecomer firms, opportunity capture exerts a stronger mediation effect than technological innovation in the relationships between acquisition, assimilation, transformation, exploitation and performance.*

As previously noticed, Zahra and George (2002), also set a first theoretical linkage between acquisition, assimilation and performance through the firms' capacity for "continually revamping their knowledge stock by spotting trends in their external environment" (p. 195) and to "reconfigure their resource bases to capitalise upon emerging strategic opportunities" (p. 196). In the same vein, Li et al. (2014) recognise that exploratory learning (approximately Zahra and George's acquisition and assimilation) can broaden a firm's horizons and enhance its ability to realise significant market opportunities through targeting emerging market segments, creating new niches and meeting the needs of emerging markets.

Following this reasoning, the ability to capture opportunities, especially market opportunities, may not necessarily require the transformation of the new knowledge acquired, or not a significant one, in the case of market-oriented innovation opportunities. Some opportunities may well be the result of deploying, analysing, processing, interpreting, and understanding information acquired from external sources. That is, acquisition and assimilation may be sufficient to generate economic performance in latecomers.

In fact, a positive effect has been proven between potential absorptive capacity and both firms' product innovation and performance (Franco et al. 2014) and between market orientation and business performance as compared to technology orientation in emerging markets (Al-Ansaari, Bederr, & Chen, 2015). In addition, since acquisition and assimilation (e.g. attending conferences and meetings, studying) activities require fewer resources than transformation and exploitation activities (Nemanich, 2005), for firms in such conditions like many latecomers are, opportunity capture may well be a more viable alternative to technological innovation in the pursuit of performance. This leads to the following hypothesis:

H2. *In latecomer firms, the mediation effects of opportunity capture in the relationships among acquisition, assimilation and performance are stronger than the ones among transformation, exploitation and performance.*

[Figure 1 near here]

In figure 1 continuous lines (for H1) and thicker lines (for H2) represent the stronger mediation effects hypothesised. If the two hypotheses are supported, it can reasonably be argued that opportunity capture exerts a stronger influence in the catching-up process of latecomer firms, even if they risk being captured in a vicious cycle of opportunity search to the detriment of original and significant innovation, eventually leading to "aborted" catch-up.

Methods

Data Collection and Sample

Data were collected from a survey carried out in Guangdong Province. The local Science, Technology & Innovation Service Centre (STISC) provided a list of all the 293 manufacturing firms above designated size (with annual sales >= RMB 20 million) located in Qingxi Town, a renowned specialised town in photoelectric and communication products at the heart of the world's biggest manufacturing hub. STISC submitted the questionnaire to firms' key gatekeepers: when possible, the general manager or the CEO, in alternative the CTO or the R&D director having knowledge of the specific data required for the study. 219 questionnaires were returned. After having dropped those with missing data, the final sample counted 166 limited liability companies in the manufacturing sector, with data referring to the period 2012-2014 (tab. 1).

[Table 1 near here]

The analysis performed by means of the two-sample t-test and two-way contingency tables highlighted no concerns about potential non-response bias. To control for potential common method bias, the procedures suggested by Podsakoff, MacKenzie, Lee, & Podsakoff (2003)

were followed. In addition, the Harman's one-factor test (Podsakoff & Organ, 1986) and a single factor Confirmatory Factor Analysis were performed after data collection.

The exploratory factor analysis with an un-rotated principle component method on all the 23 measure items of the main constructs (acquisition, assimilation, transformation, exploitation; opportunity capture and performance) resulted in three factors with eigenvalues >1, together accounting for 81% of the total variance. This indicates that there is neither a single nor a general factor explaining the majority of covariance among the measures, showing that the performed analyses do not suffer from inherent common method bias. The single factor CFA on the same items on one hypothetic factor generated a very poor model fitting as expected: $\chi 2$=2383.52, d.f.=230, p<0.0001, RMSEA=0.237, CFI=0.593 TLI=0.552, SRMR=0.139. This again excludes the possibility of a single common factor underlying these measurement items.

Measures

To maximise reliability and validity, the construct measurements (tab. 2) rely as much as possible on the existing literature.

Absorptive Capacity. Following Zahra and George's (2002) conceptualization, the 14-item scale developed by Flatten et al. (2011a) was used to measure knowledge acquisition (3 items), knowledge assimilation (4 items), knowledge transformation (4 items) and knowledge exploitation (3 items). All items used a 7-point Likert scale, from 1="To no extent" to 7="To a great extent". After an exploratory factor analysis for each group of items, each dimension was measured with the average score of the respective items.

Technological Innovation. The measurement referred to SOEC (1997) and OECD (2005) definition as implemented technological product and process innovation (and product innovation specifically). Technological product innovation is the introduction of goods or services whose technological characteristics or intended uses significantly differ from existing

products, or whose performance has been significantly enhanced or upgraded. This definition allowed to focus on "originality" and "significance" and therefore to avoid potential ambiguities about the meaning of new products that may lead to gathering mere marginal modifications or new-to-the-enterprise products, which may occur in the Chinese context (Xu et al., 2012). Accordingly, technological innovation was measured as a ratio between the number of radical/truly innovative new or significantly improved products introduced into the market and the whole number of new or significantly improved products introduced into the market by the firm.

Opportunity Capture. After an exploratory factor analysis, we retained all the three items on the 7-point Likert scale developed by Li et al. (2014) for the Chinese context for opportunity capture, which was measured using the average score of the three items.

Performance. Six items on a 7-point Likert Scale gathered from Flatten, Greve and Brettel (2011) and Wang and Zhang (2009) were used to ensure that respondents consider both absolute and relative performance. This paper uses subjective performance measurements to overcome the difficulties in gathering objective data on all the relevant dimensions of performance. This choice is supported by studies proving strong and positive correlations between objective and subjective measures (Chandler & Hanks 1993) and using a similar approach (Al-Ansaari et al., 2015; Kantur, 2016). After an exploratory factor analysis, performance was measured with the average score of all the six items used to gauge performance in the survey undertaken, i.e.: market share growth, return on sales, sales growth, return on investments, return on equity and customer retention.

Control Variables. The literature identifies significant effects of size, longevity and sectors on innovation (Damanpour, 1992; Malerba, 2002; Pavitt, 1984), therefore firms' dimension, age and industry were used as controls. Size was measured as the average number of employees,

age as the time span from the establishment to 2014, and the sector using the 4-digit sectoral classification codes (GB/T 4754-2011) gathered from secondary sources.

Analysis and Results

Reliability and Validity

Prior to analyses, measures were tested conducting confirmatory factor analyses and calculating Cronbach's coefficient alpha and average variance extracted (AVE) for the six first order factors, i.e. acquisition, assimilation, transformation, exploitation, opportunity capture, and performance (Table 2).

Structural equation modelling was used to assess the dimensionality, reliability and validity of the absorptive capacity measures. The overall model fit was $\chi 2=463.81$, d.f.=215, $p<0.0001$, RMSEA=0.083, CFI=0.953, TLI=0.945, SRMR=0.028. According to Hu and Bentler (1999), when the sample size is N<=250, as is the case of this research, the combinational rules based on RMSEA (or TLI) and SRMR tend to reject more simple and complex true-population models under the non-robustness condition. Thus, although the model is not perfect (RMSEA=0.083 exceeds the cut-off point of 0.06), the other measures still support sufficient goodness-of-fit according to the two-index combination rules (Hu & Bentler, 1999).

[Table 2. Near here]

All Cronbach's alphas were higher than 0.9, indicating high internal consistency. Individual items' reliability values ranged from 0.74 to 0.94 and the composite reliability values were >0.9, exceeding the thresholds (Bagozzi & Yi, 2012). AVE values were higher than 0.8 (Fornell & Larcker 1981), thus the model achieved satisfactory reliability. All factor weights

relating items to the hypothesised latent variables were significant (tab. 2), indicating satisfactory convergent validity (Bagozzi, Yi, & Philips, 1991). Discriminant validity was further analysed (Fornell & Larcker 1981) and each construct's AVE value was significantly higher than the shared variance between them, satisfying the discriminant validity criteria at construct level. A test of item-level discriminant validity also generated satisfactory results. Further inspection of the absolute standardised correlations between constructs allows rejecting the hypothesis that factors are perfectly correlated (Bagozzi et al. 1991).

Table 3 describes the variables and their correlations. According to the mean, less than one-fifth new products represents a veritable technological innovation. Transformation mean is lower than the other key processes. Correlations of opportunity capture with absorptive capacity dimensions are stronger than those with technological innovation. Altogether, this echoes what discussed earlier. In addition, performance displays a higher correlation with opportunity capture than with technological innovation. These correlations also confirm the validity of the mediation choice, since mediation is advised when there is a strong relation between the independent and the dependent variable (Baron & Kenny, 1986).

[Table 3 near here]

Tests of Hypotheses

Hypotheses were tested within a mediation-modelling framework (Baron & Kenny, 1986) using Hayes's (2013) multiple mediation analysis techniques and purposefully developed PROCESS tool on SPSS©.

More specifically, a parallel multiple mediation model was used, assuming that the two mediators (i.e. opportunity capture and technological innovation) were not causally influencing each other. Because of the assumptions about the differential effects expected by

the single dimensions of absorptive capacity inherent to the multi-dimensional conceptualization adopted, four models were run, separately entering each dimension.

Mediation effects were tested using bootstrapping. Simulation studies (Fritz & Mackinnon, 2007) proved it to be more powerful than Baron and Kenny's (1986) approach and more flexible than others popular approaches (Hayes, 2009). Furthermore, bootstrapping is useful with smaller samples and explicitly quantifies the indirect effect, not requiring any inference about the statistical significance of each path in the causal sequence that defines the mediating effect (Hayes, 2009). Mediation will be supported if the confidence intervals generated by the bootstrapping procedure would not contain zeros.

To check H1, it is sufficient to look at the significance and size of the indirect effects ("paths" in Table 4) running respectively from acquisition, assimilation, transformation and exploitation to performance through opportunity capture and technological innovation. Tab. 4 shows evidence of significant and greater indirect effects of acquisition, assimilation, and transformation through opportunity capture against technological innovation. Exploitation showed greater values too, but no significant mediation effect.

With point estimates of respectively .168, .127 and .126 (within 95% bias corrected CIs from .046 to .322 for acquisition, from .005 to .281 for assimilation and from .000 to .287 for transformation) these effects are all more than twice the indirect effects through technological innovation. Respectively, they are point estimates of .059 within a 95% bias corrected CI from .014 to .128 for the first; .050 within a 95% bias corrected CI from -.003 and .112 for the second, and .051 within a 95% bias corrected CI from .007 to .107 for the third. These values are in line with the effect size of opportunity capture calculated as completely standardized indirect effects (respectively .171, .128 and .128) and the respective ratios of indirect to total effects, i.e. .4460, .2702, .2742, all more than twice of the respective ratios for technological innovation (respectively .1566, .101, .111). This, although with all the limitations commented

extensively in Preacher and Kelley (2011), gives further strength to the results obtained and related implication drawn in which that follows. The last confidence interval shows that technological innovation does not even mediate assimilation. Exploitation reports point estimates of .061 and .039 both including zeros 95% bias corrected Cis (from -.051 to .215 for opportunity capture and from -.010 to .095) for technological innovation. In all models, control variables were neither significant nor relevant. Therefore, H1 is supported. Whereas the indirect effects of acquisition through opportunity capture are greater than the indirect effects of transformation, and exploitation is not even significant, the one of assimilation is not. In fact, the coefficient is the same as for transformation. Therefore, H2 is only partially supported.

[Table 4 near here]

Discussions

Findings supported the assumption of opportunity capture to be a viable alternative path to performance against technological innovation. Although its mediation effects turned to be higher than other dimensions only for knowledge acquisition and not for knowledge assimilation, this remains consistent with our theory. The latter results may be explained in relation to the different kinds of opportunity capture we intended. More in detail, whereas acquisition is related to 'pure' markets' opportunity capturing deriving from deploying, analysing, processing, interpreting, and understanding information acquired from external sources, assimilation may be related to the one associated with the exploitation of slight adaptions of existing technologies to capture market-oriented innovation opportunities; the latter requiring both assimilation and some transformation. If to this, we add the 'transformation gap' latecomer firms suffer (Petti & Zhang, 2016), we may probably have a possible explanation of the findings obtained.

This latter consideration is important because, despite opportunity capture demonstrated to be an alternative path to performance, and therefore a source of funds for latecomer firms' catching-up, this is rather a necessary, but not sufficient, condition for catching-up. If the firms does not focus on the development own innovative technology at the same time, the better performance effects of opportunity capturing may even lead to impair latecomer firms' long-term motivations to innovate, so as to eventually make it difficult for them to complete their catch-up process. Several works have in fact highlighted how opportunity-capturing endeavours, especially the 'pure' market-oriented ones, may stifle the development of original innovations (Bennet & Cooper 1979; Christensen & Bower 1996; Berthon, Hulbert, & Pitt, 1999). This phenomenon has also been argued to affect Chinese latecomers catching-up (Liu, 2008) concerning market-oriented innovations. The author argues that in hypercompetitive markets such as China, understanding and responding rapidly to market needs may be more important than technology development. Conversely, since these kinds of innovations demand fewer R&D resources and shorter lead times, we therefore infer that, in such situations, latecomer firms' catch-up strategies may also stuck latecomers within the gradual catch-up stage and prevent them to forge ahead, eventually leading to an "aborted" catch-up (Lee and Malerba, 2017). This may also explain why many latecomer firms, with particular reference to Chinese firms, remain captured within cycles of secondary innovation, which some practitioners consider to be a model rather a phase within the catching-up process, regardless of its limitations.

For practitioners, this may be an expensive perspective to hold. Within this perspective, downstream absorptive capacity processes (transformation and exploitation) remain marginal, constraining technological innovation within the technology acquired and the knowledge gained. This bears long and short-term risks. The long-term risk would be to be captured by such short-term market and existing technology opportunity capturing undertakings, rather

than engaging in far-reaching knowledge and technology development. This will 'marginalize' a latecomer firm in global value chains and international markets. This issue is relevant also for managers and policy makers. Managers need to consider that relying excessively on market and market-oriented innovation opportunities may lead to underinvestment in knowledge transformation, inhibiting the development of advanced capabilities. In addition, this may lead to pursuing too many opportunities which may further divert the firm's resources into marginal initiatives while not increasing the overall innovation capabilities, referred to here as a kind of "entrepreneurial overstretch", well diffused in other contexts such as start-ups, but not healthy in established firms.

If widespread, this may put at stake the overall country's scale-up ambitions, so this is also an issue for policy makers. If catching-up cannot be taken for granted, indiscriminately supporting latecomers may just promote the same kind of adverse selection generated by pro-start-up policies that concerned Shane (2009). The consequence might be a worsening in excess capacity, as happened, for instance, in several Chinese industries after the crisis stimulus package. Conversely, selective policies might be more desirable, aiming at directing funds to firms with a higher potential to make good use of them (e.g. focusing on improving their internal R&D and original innovation). Policies promoting the investment in "soft"-factors, for instance, programs such as the 1000 talents, enhancing higher education and linkages between universities and industries like Guangdong Technology Expert Secondment Program (TESP) or the reform of the Hukou system and the incentives to better companies welfare, might be more successful in favouring the catch-up. In this perspective, the specific type of policy (e.g., direct subsidies, procurement policies, tax incentives, favourable loans, etc.) is less important than the identification of the right target firms. Therefore, policies should not only be selective, but also targeted.

Conclusions

This work analysed a non-obvious effect of opportunity capture that can constrain latecomers' technological innovation. In doing so, it contributes to the literature on latecomer firms' innovation and catch-up. In particular, it deals theoretically and empirically with an important but neglected mechanism that may induce latecomers to underestimate technological innovation. Accordingly, they also reveal some potential downsides of entrepreneurial behaviours in specific contexts and circumstances.

The research also has some limitations, which further research can address.

Firstly, in the survey there was only one respondent, though highly reliable. Although all standard tests to rule out possible biases have been performed, data from multiple sources may be collected for future researches. Secondly, the analysis is cross-sectional and it might benefit from a longitudinal study. This would allow further investigating the causality of linkages detected and the evolution of performances and innovation behaviours. Thirdly, recent studies on latecomer firms, with particular reference to the Chinese context, have indicated that these firms draw more from a wider range of foreign and domestic knowledge external sources (e.g. Chen & Qu, 2003). Our study is mainly focused on the behaviour of firms with regard to the acquisition, assimilation, transformation and exploitation of external knowledge rather than on the sources of this knowledge. Therefore, future studies must consider the role of external knowledge and the different types of it more explicitly. Finally, new researches may introduce external environmental variables as moderators to enrich and further prove the assumptions illustrated here.

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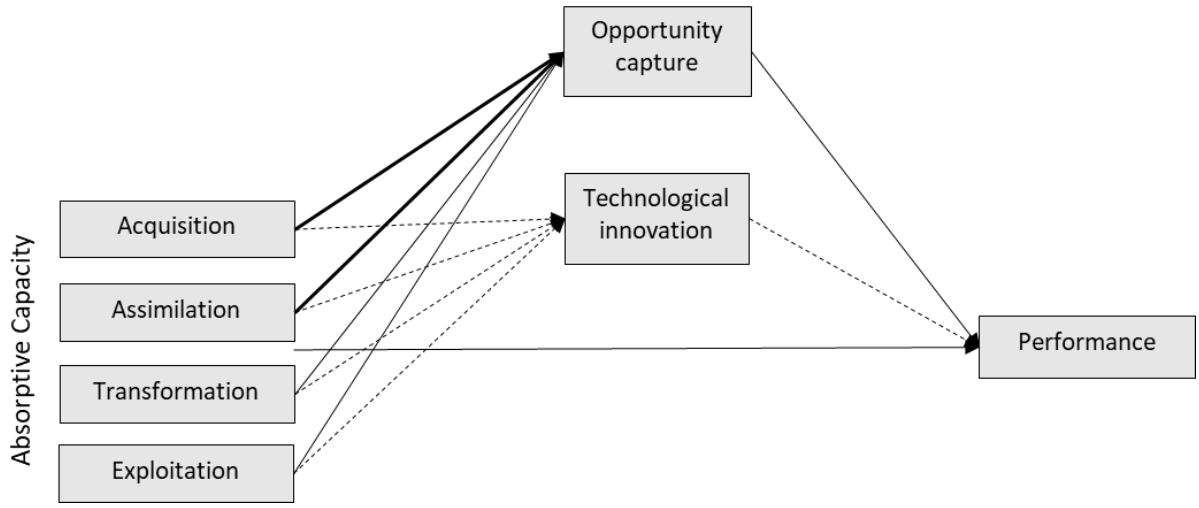

Figure 1. Conceptual framework

Table 1. Study Sample

1. Number of employees	%
<50	1.2
51-300	51.2
301-500	21.1
501-2000	23.5
2000+	3.0
2. Sales Revenue (in million RMB)	
20-50	30.1
51-200	52.4
201-1000	14.5
1000+	3.0
3. Firm age (years)	
3-5	27.7
6-10	27.1
11-15	25.3
16 +	19.9
4. Industry affiliation	
Computers, communication & other electronics equipment	32.7
Electrical machinery & equipment	13.3
General and special purpose equipment	12.7
Metal products	9.6
Chemical products	9.0
Others Manufacturing	22.7
5. Share of R&D employees	
0	29.5
0-10%	49.4
11-20%	13.9
21-30%	2.4
31%+	4.8

Table 2. Measures Reliability and Validity

Constructs	Standardized Factor Loading	Cronbach's Alpha	Individual Item Reliability	Composite Reliability	Average Variance Extracted
Knowledge Acquisition		0.93		0.93	0.81
The search for relevant information concerning our industry is every-day business in our company	0.87		0.75		
Our management motivates the employees to use information sources within our industry	0.93		0.87		
Our management expects that the employees deal with information beyond our industry	0.91		0.82		
Knowledge Assimilation		0.95		0.96	0.84
In our company ideas and concepts are communicated cross-departmental	0.90		0.80		
Our management emphasizes cross-departmental support to solve problems	0.94		0.88		
In our company there is a quick information flow, e.g., if a business unit obtains important information it communicates this information promptly to all other business units or dept.s	0.92		0.84		
Our management demands periodical cross-departmental meetings to interchange new developments, problems, and achievements	0.92		0.85		
Knowledge Transformation		0.97		0.97	0.89
Our employees have the ability to structure and use collected knowledge	0.93		0.87		
Our employees are used to absorbing new knowledge as well as to prepare it for further purposes and making it available	0.95		0.90		
Our employees successfully link existing knowledge with new insights	0.95		0.89		
Our employees are able to apply new knowledge in their practical work	0.95		0.91		
Knowledge Exploitation		0.95		0.95	0.86
Our management supports the development of prototypes	0.89		0.78		
Our company regularly reconsiders technologies and adapts them in accordance with new knowl.	0.95		0.90		
Our company has the ability to work more effectively by adopting new technologies	0.95		0.90		
Opportunity Capture		0.94		0.94	0.83
Highlight on alertness and speed in responding to opportunities	0.90		0.81		
Focus on pursuing high-potential business prospects	0.91		0.82		
Utilize the capabilities of discovering potential value to create competitive advantage.	0.93		0.87		
Performance		0.97		0.97	0.85
Growth in market share	0.90		0.81		
Return on sales	0.97		0.94		
Growth in sales	0.95		0.90		
Return on investment	0.94		0.89		
Return on equity	0.90		0.81		
Customer retention	0.86		0.74		

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Table 3. Descriptive Statistics and Correlations

Constructs	Mean	Standard Deviation	1	2	3	4	5	6	7	8	9	10
1. Knowledge Acquisition	3.61	1.61	1.000									
2. Knowledge Assimilation	4.03	1.74	.797**	1.000								
3. Knowledge Transformation	3.74	1.63	.771**	.813**	1.000							
4. Knowledge Exploitation	4.10	1.93	.673**	.843**	.812**	1.000						
5. Technology Innovation	.18	.29	.373**	.400**	.362**	.403**	1.000					
6. Opportunity Capture	4.57	1.71	.602**	.626**	.653**	.674**	.334**	1.000				
7. Performance	3.84	1.39	.385**	.480**	.467**	.564**	.312**	.432**	1.000			
8. Firm Size	520	791	.134	.166*	.091	.135	.018	.113	.064	1.000		
9. Firm Age	9.96	5.54	.066	-.028	.056	-.021	.063	.067	-.052	.139	1.000	

N=166. ** Correlation is significant at 0.01 level (2-tailed). * Correlation is significant at 0.05 (2-tailed).

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Table 4. Analysis of Results

	Path Coefficients			Indirect Effects			
	to Opportunity Capture (OPPC)	to Technological Innovation (TI)	to Performance (PERF)	Point estimate (effect)	s.e.	Lower 95% C.I.	Upper 95% C.I.
Model 1							
from Acquisition (ACQ)	.591**** (.063)	.367**** (.073)	.150 (.088)				
from Opportunity Capture (OPPC)		-	.285** (.086)				
from Technological Innovation (TI)			.161* (.075)				
Path 1: ACQ→OPPC→PERF				**.168**	**.070**	**.046**	**.322**
Path 2: ACQ→TI→PERF				**.059**	**.029**	**.014**	**.128**
	R^2= .367 F(4;161)= 23.327 p <.0001	R^2= .157 F(4;161)= 7.506 p < .0001	R^2= .241 F(6;159)= 8.423 p < .0001				
Model 2							
from Assimilation (ASS)	.623**** (.062)	.405**** (.072)	.293** (.089)				
from Opportunity Capture (OPPC)		-	.204* (.086)				
from Technological Innovation (TI)			.124 (.074)				
Path 3: ASS→OPPC→PERF				**.127**	**.070**	**.005**	**.281**
Path 4: ASS→TI→PERF				.050	.028	-.003	.112
	R^2= .402 F(4;161)= 27.107 p <.0001	R^2= .185 F(4;161)= 9.122 p< .0001	R^2=276 F(6;159)= 10.101 p< .0001				

Total Effect Model 1= .378**** (.072), Direct Effect .150 (.088)
Total Effect Model 2= .470**** (.069), Direct Effect .293** (.089)

* Sig. <.05; **Sig. <.01; ***Sig. <.001; ****Sig. <.0001

	Path Coefficients			Indirect Effects			
	to Opportunity Capture (OPPC)	to Technological Innovation (TI)	to Performance (PERF)	Point estimate (effect)	s.e.	Lower 95% C.I.	Upper 95% C.I.
Model 3							
from Transformation (TRA)	.641**** (.060)	.351**** (.073)	.282** (.089)				
from Opportunity Capture (OPPC)		-	.196* (.089)				
from Technological Innovation (TI)			.145* (.073)				
Path 1: TRA→OPPC→PERF				**.126**	**.074**	**.000**	**.287**
Path 2: TRA→TI→PERF				**.051**	**.025**	**.007**	**.107**
	R^2= .431 F(4;161)= 30.534 p <.0001	R^2= .147 F(4;161)= 6.937 p < .0001	R^2= .273 F(6;159)= 9.930 p < .0001				
Model 4							
from Exploitation (EXP)	.668**** (.058)	.401**** (.072)	.451**** (.090)				
from Opportunity Capture (OPPC)		-	.091 (.087)				
from Technological Innovation (TI)			.096 (.071)				
Path 3: EXP→OPPC→PERF				.061	.068	-.051	.215
Path 4: EXP→TI→PERF				.039	.027	-.010	.095
	R^2= .463 F(4;161)= 34.700 p <.0001	R^2= .183 F(4;161)= 9.010 p< .0001	R^2=333 F(6;159)= 13.284 p< .0001				

Total Effect Model 3= .458**** (.068), Direct Effect .282** (.089)
Total Effect Model 4= .551**** (.064), Direct Effect .451**** (.090)

* Sig. <.05; **Sig. <.01; ***Sig. <.001; ****Sig. <.0001