

Small Firm Adaptive Capability, Competitive Strategy and Performance

Outcomes: Competing Mediation vs Moderation Perspectives

Chrysochoidis, G., Dousios, D., and Tzokas N.

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Main message from the manuscript:

In small firms, adaptive capability exercises a handling grip on competitive strategy for superior performance primarily acting as a mediator and may offset, through attenuation, the adverse impact of limited resources.

Three additional sentences

Besides exercising a handling grip on competitive strategy adaptive capability is more important than competitive strategy per se for superior performance.

Adaptive capability simultaneously undertakes additional secondary roles reinforcing innovation competitive strategy for innovation related outcomes. Adaptive capability reflects managerial proficiency for competitive actions which is why it may offset, through attenuation, the adverse impact of small firm limited resources.

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INTRODUCTION

Competitive strategy influences performance (e.g., Hitt *et al.*, 2003; McGee and Rubach, 2011) but there is a gap of knowledge on how this influence takes place (Porter, 1991). Dynamic capabilities (Teece *et al.*, 1997; Ambrosini *et al.*, 2009) offer a conceptual bridge however, as they address the missing connection between resource possession and resource exploitation (Zahra *et al.*, 2006; Newbert, 2007). We cannot assume though that all dynamic capabilities operate similarly in different size firms, nor that they have a similar role in the competitive strategy - performance relationship. Wang and Ahmed (2007) suggest that it is ‘adaptive capability’ that matters for this purpose (p. 37) – yet its important role in the small firm competitive strategy - performance relationship has neither received adequate treatment nor been empirically studied. Our work provides a remedy and we make two contributions. First, we explain and empirically assess the importance and role of adaptive capability in the small firm competitive strategy - performance relationship. Second, we clarify the causal pathway through which adaptive capability exercises this role by juxtaposing two conceptually different explanations, namely mediation versus moderation.

Our research question is therefore: How does small firm adaptive capability alter the relationship between small firm competitive strategy and performance outcomes in terms of:

- a) strength (i.e., when adaptive capability is considered, does the relative importance of competitive strategy, in its relationship with performance outcomes, change?), and
- b) nature (i.e. when adaptive capability is considered, what is the causal pathway through which competitive strategy exercises its influence?).

Our theoretical framework follows; then, we provide the details regarding our empirical study.

THEORETICAL FRAMEWORK

Adaptive Capability

A firm possesses adaptive capability when it prominently ‘adapts, responds and reacts’ (Grewal and Tansuhaj, 2001; Krohmer *et al.*, 2002). This happens because adaptive capability focuses on ‘effective search and balancing exploration and exploitation strategies’ (Staber and Sydow, 2002; Wang and Ahmed, 2007) through flexible resource adjustment, application and renewal (Ambrosini *et al.*, 2009: S15; Sanchez, 1995; Wang and Ahmed, 2007: 37). Adaptive capability is able to do so because it resides at the highest level of the hierarchy of firm dynamic capabilities; been powered therefore to utilize multiple other lower-level dynamic capabilities for its own function and aims.

To view dynamic capabilities through a hierarchy lens is important. Dynamic capabilities were introduced as an efficiency platform– an extension to the resource-based view of the firm (Wernefelt, 1984) and defined as the assets by which firms “integrate, build and reconfigure internal and external competencies to address rapidly changing environments” (Teece *et al.*, 1997: 516) (see also Barreto, 2010 for a review of other definitions). The view that dynamic capabilities operate as a hierarchy is rooted in Collis (1994) who assigned firm resources and capabilities at four layers. The first layer represented the resource base of the firm itself; the second represented the modification of existing resources; the third represented the extension of current capabilities while the fourth regarded a higher-order capacity, seen as a meta-routine. Subsequently, Danneels (2002) dichotomized dynamic capabilities in ‘first-order’ (representing a firm’s capacity to achieve individual tasks) and ‘second-order’ (tapping into the firm’s ability to renew through the creation of new ‘first-order’ ones) and Winter (2003) similarly argued that dynamic capabilities operate to

extend, modify or create ordinary capabilities. Zahra *et al.* (2006:947) argue “an infinite spiral of capabilities to renew capabilities could be conceived” (see also Brady and Davis, 2004). Moreover, Ambrosini *et al.* (2009) proposed a 3-level view of dynamic capabilities. The first level represents incremental repeatable capabilities (see also Helfat *et al.*, 2007; Helfat and Peteraf, 2003) which become embedded in the firm’s structures and stabilize as firm patterns (Zollo and Winter, 2002). The second level adjusts the resource mix by improving existing and developing new resources (see also Helfat *et al.*, 2007; Makadok, 2001; Maritan, 2001, 2007). The third level recreates however, the physiognomy of the firm components themselves and it allows the firm as a whole to change towards new states and practices (Ambrosini *et al.*, 2009:19). Recreation occurs through grasping of market needs through the establishment of a ‘dialogue’ throughout the firm to ‘translate’ this knowledge for action – an organizational renewal process (see also Barr *et al.*, 1992; Tripsas and Gavetti, 2000). Such recreation is also specific to each firm as dynamic capabilities are built within each firm’s boundaries. The repercussion is that even if some base-layer resources may be similar, top-layer capabilities are not and these function in firm-unique and firm-distinct ways.

Adaptive capability is located at the top level and it is a higher importance dynamic capability operating in each firm uniquely and distinctly. Important to all firms but even more for small ones, adaptive capability rests on entrepreneurial competences and refers to clusters of small firm activities and adjustments for sensing, seizing and transforming (Teece, 2012: 1396). Adaptive capability allows the small firm to adeptly do so (e.g., Wang and Ahmed, 2007: 37) and in doing so, it profoundly affects small firm competitive strategy - performance relationship.

Small firm competitive strategy, adaptive capability and performance outcomes

Strategy echoes a pattern in a stream of decisions (Certo and Peter, 1991; Steiner and Miner, 1977; Whittington, 1993) and competitive strategy helps realize performance objectives (e.g., Lamberg *et al.*, 2009; Miller, 1992; Sheth and Sisodia, 2002). Researchers discussed the interface between competitive strategy and resource-based thinking (e.g., Barney, 1991; Conner, 1991; McGahan and Porter, 1997; Peteraf, 1993). Researchers also discussed the importance of managerial action for leveraging key firm resources and resource orchestration (e.g., Helfat *et al.*, 2007; Sirmon *et al.*, 2011) so to achieve superior performance (e.g., Ndofor *et al.*, 2011; Sirmon *et al.*, 2007). Few works have however, empirically studied the influence of dynamic capabilities upon performance *per se*. Among them, Song *et al.* (2005) studied large US firms and found that marketing and technological capabilities matter in highly turbulent environments. Zúñiga-Vicente and Vicente-Lorente (2006) study of Spanish banks also found that firm ability to move strategically allows survival. Lin and Wu's (2014) study of large Taiwanese firms also identified that dynamic capabilities have positive effects on Return on Assets over 3 years. In contrast, Wilden *et al.* (2013) study of large Australian firms found that dynamic capabilities have a negative effect on sales growth.

Focusing on the link between dynamic capabilities, performance outcomes and competitive strategy, Ortega's (2010) study of Spanish information and telecommunication technology firms suggested that the theoretical prescriptions of competitive strategy and dynamic capabilities effectively combine for maximum effect. Makkonen *et al.* (2014) provided an important clarification though. Their study of Finnish firms identified a direct effect of dynamic capabilities upon organizational change issues which in turn positively affects innovation performance. They argued that these are applicable to all sectors, including low-tech and traditional ones (p.2715) explicitly naming such change aspects 'organizational adaptive behavior' (p. 2707). A small firm case study they further focused on succeeded by

exploitation of its renewing and regenerative capabilities by constantly adapting its actions (p. 2714) much in alignment with Teece's (2012) comment that capabilities resting on 'competences' matter most. These findings form the basis for our arguments regarding the intervention of adaptive capability in the small firm competitive strategy - performance outcome relationship, which are as follows.

Our first argument. We know that the relationship between competitive strategies and performance outcome is not static (Mintzberg and Westley, 1992; Porter, 1991; Shay and Rothaermel, 1999; also see Hutzschenreuter and Israel, 2009: 454) and internal organizational elements are relevant. We also know that these internal organizational elements specifically refer to dynamic capabilities (e.g., Makkonen *et al.*, 2014; Rindova and Kotha, 2001; Wang and Ahmed, 2007; Zahra *et al.*, 2006). Yet, the extent of dynamic capabilities' influence in the competitive strategy performance outcomes relationship is unclear. Barreto's review (2010) concluded that conceiving dynamic capabilities as a single overarching entity yielded competing premises regarding their effects upon performance (p. 263 and 271). Eriksson (2014) meta-analysis also does not mention past works on the link between dynamic capabilities and competitive strategy foci (p. 67). Though, Makkonen *et al.*'s (2014) study clarified that it is not dynamic capabilities *per se* but instead (constant) adaptive behavior of the organization what affects positively and directly performance (in line with Rindova and Kotha (2001) who name this adaptive behavior 'constant morphing').

Our second argument. Dynamic capabilities' impact is pronounced in small firms. Zahra *et al.* (2006) explicitly comment that link between dynamic capabilities and outcomes is primarily investigated only in larger and well-established firms (p. 942). This is not useful when Eriksson's (2014) identified, in her review of literature on dynamic capabilities, that

resource scarcity (inherent in small firms) is a crucial element for dynamic capabilities' existence, function and performance outcomes (p. 71). Furthermore, Døving and Gooderham (2008) and Spanos and Lioukas (2001) identified that dynamic capabilities are affected by the existence of limited internal assets and Gurisatti *et al.* (1997) also found that success for small firms depends on developing new competences of 'a cumulative character'. Wiklund and Shepherd (2003) demonstrated that the challenges facing small firms are different from the challenges facing larger firms. Their study also showed the importance of dynamic capabilities in small firms for performance outcomes. Neither can we assume dynamic capabilities to exist, operate similarly, nor treat them as such, in large and small firms (Baretto, 2010: 276-277).

Our third argument. The importance of adaptive capability in small firms is not only pronounced but also has an extended and dual role. The idiosyncrasies of the decision-makers and their proficiency matters (e.g., Cyert and March, 1963; Papadakis *et al.*, 1998). Such idiosyncrasies and proficiency are especially relevant for small firms as their decision makers constantly need to reconfigure resources in new ways (e.g., Sirmon and Hitt, 2003; Winter, 2003). Adaptive capability as a dynamic top-level process encompasses the capacity to regenerate and reconfigure existing small firm assets for competitive acts but in doing so, importantly, also simultaneously attenuates small firm resource limits' impact. This means that adaptive capability in small firms offsets at the same time (of competitive acts) through attenuation, the adverse impact of their limited resources. Therefore, in a small firm context, the connection between resource possession and exploitation is invigorated though both concurrently weakening the impact of limited resources and making more effective/efficient use of extant resources through adapting actions, responding towards market opportunities and fastening the pace of small firm's reaction to such opportunities.

Our fourth argument. Adaptive capability functions in a similar way with respect to small firm competitive strategy. While reducing the impact of resource limitations, adaptive capability unfolds effectively and efficiently outward oriented actions attenuating, withholding, stimulating or altering strategy formation and implementation. Powered from its position at the top of the hierarchy of dynamic capabilities, drawing upon and using lower-layer ones as needed, proficiently and singularly manages in itself competitive strategy. Learning is also central to this (Porter; 1991:109; Teece *et al.*, 1997) as it leads to accumulation, integration and management of organizational knowledge (Kogut and Zander, 1992; Senge, 1990), improved practices (Lumpkin and Lichtenstein, 2005) and detection of misalignments (Argyris, 1990). Makkonen *et al.* (2014) provide evidence for the above when they comment that their small firm case “monitors and constantly develops its internal efficiency”... “continuously reconfiguring its resource base” but also “constantly monitoring consumer behavior” and “creating new products and processes” (p. 2716). These interface well with Eisenhardt and Martin’s (2000) comment that time is central to strategy for performance outcomes (p. 1118) – adaptive capability calibrates and handles the time dimension. Next, these concur with Teece’s (2012) view regarding chief individuals’ own skills around sensing, seizing, and transforming that matter most. In our case, they regard strategizing and good strategy execution. Last, but not least, these also align with Zahra *et al.*’s (2006) comment, that the management of dynamic capabilities is critical in gaining organizational performance-related benefits (p. 924).

In conclusion, the inherent nature of adaptive capability is about proficient management of the organization and here this proficiency refers to the management of both other dynamic capabilities and competitive strategies for organizational performance-related benefits. Our stance is therefore different from Ortega’s (2010). We conceptualize that in

small firms adaptive capability generates together with competitive strategy superior performance outcomes but it does so through managing (i.e., handling, acting on and overseeing) competitive strategy adding on top its own increased influence to generate a combined maximum effect. By doing so, it may become more important than competitive strategy.

Our fifth argument. Adaptive capability's proficiency should likely function to serve its aims irrespective of the environment. Song *et al.* (2005) and Wilden *et al.* (2013) identified moderating effects of firm environment in support of Eisenhardt and Martin's (2000) earlier argument that the potential gain from dynamic capabilities is greater in dynamic or moderately dynamic environments. Yet, this may not a necessary condition (Zahra *et al.*, 2006: 922) or depends upon the context (Makkonen *et al.*, 2014: 2715) – e.g., Ortega's (2010) positive moderating effect of dynamic environment may be due to the nature of the studied sector (high technology). Makadok (2001) does not also acknowledge external environmental conditions, implicitly assuming the irrelevance of such conditions. These also appear to play a lesser role in other studies (Barreto, 2010: 262, 276).

Our sixth argument. In a valuable effort, Hughes *et al.* (2007) looked at drivers of response performance. Our stance complements and extends assertions in their work regarding both the nature and conceptual positioning of adaptive capability. They suggested that the construct represents a measure for response performance in emerging young firms. We agree that adaptive capability may represent a performance reflection when the context of inquiry involves startups and emerging small firms (Hughes *et al.*, 2007) but as Meyer *et al.* (1993) clearly suggest this becomes instead an organizational imperative as firms mature (p. 1177-1178). Hughes *et al.*, (2007) findings also fully complement Teece (2012). Their

findings suggest that entrepreneurial orientation in young small firms is configured to dimensions and ideal profiles to *reach* response performance, in other words to acquire adaptive capability *per se* so to become competitive and sustain competitiveness. This is an important issue explained next.

When the inquiry refers to organizations that reach a stage of maturity, adaptive capability reflects a small firm dynamic capability about constant renewal and regeneration, an organizing imperative that also relates to strategy implementation (Chen and Hambrick, 1995). Based on past works including Makkonen *et al.* (2014), adaptive capability and its dimensions reflects in mature small firms the process for action and action execution speed respectively. What is an initial indicator of performance in emerging young firms becomes a way of life in mature small firms reflecting entrepreneurial competences for acting and also do so fast. Next, Zahra *et al.*, (2006) also argue that younger firms seek to upgrade dynamic capabilities (thus this becomes a dependent) while ‘established firms are likely to be more deliberate in their approach to thinking about, developing, and reconfiguring such capabilities –reflecting an organizational element (p. 938). In conclusion and under the light of the comments above, adaptive capability in mature small firms is an utter importance dynamic capability; an organizational element central for reaching superior performance, but not a performance reflection *per se*. Based upon our six arguments, our first hypothesis:

H1: Adaptive capability is positively associated with small firm performance.

Furthermore, we isolate and test two competing causal pathway explanations (Baron and Kenny, 1986; Durand and Vaara, 2009) regarding the intervention of adaptive capability in the competitive strategy - performance relationship which we explain next.

Adaptive capability mediates the path competitive strategy performance outcomes

This stance argues that adaptive capability transforms and transmutes the effects of competitive strategy for performance while, as a unique dynamic capability, simultaneously acts on its own for additional performance (see Figure 1). In doing so, the direct influence of competitive strategy upon performance diminishes or dissipates. Adaptive small firms through a deeply embedded masked effect of learning generate new knowledge essential to manage competition initiatives and reconfigure effectively and efficiently limited resources. Drawing upon constant learning, they subsequently use multiple lower-order other dynamic capabilities to enable organizational adaptive behavior, which in turn positively affects performance (Makkonen *et al.*, 2014). Adaptive capability exercises its direct effect upon performance but at the same time also, uniquely and distinctly, exercises a handling grip on competitive strategy through the proficient management of competitive strategy. Under this view, competitive strategy's influence upon performance becomes subsided under proficiency of managerial action. Thus, our second hypothesis:

H2: Adaptive capability mediates the relationship between competitive strategies and performance

Adaptive capability moderates the path competitive strategy performance outcomes

The hypothesis is that competitive strategy positively influences performance, but adaptive capability accelerates and multiplies the influence of competitive strategy upon performance (see Figure 2). In other words, irrespectively of its own direct influence upon performance, adaptive capability complements competitive strategy, decision-making reinforcing the strength of competitive strategy and its own independent influence upon performance outcomes. Small firms fast and flexibly adjust their scarce resources and

capabilities, and manage to, strategically, leverage these to capitalize on emerging opportunities. Leveraging re-compensates for stressed resources, but also importantly reinforces the impact of small firms' competitive strategy in its new product, market and financial performance (Kandemir and Acur, 2012; Ortega, 2010). Ortega (2010) argument that competitive strategy and dynamic capabilities combine for maximum effect offers a clear support to this stance. Ortega's (2010) study showed that differentiation and low cost competitive strategy together with marketing, technological and managerial capabilities explained 39% of performance variance. Managerial capabilities reflected firm climate, organizational structure efficiency, efficient coordination, knowledge and skills of employees, and managerial competences. Although adaptive capability may have its own impact upon performance, it simultaneously effectively acts by 'overclocking the processor speed' of competitive strategy. This stance implies therefore that adaptive capability acts by 'squeezing every last ounce' of performance power out of competitive strategy *per se*. Thus, our third hypothesis:

H3: Adaptive capability moderates the influence of competitive strategies upon performance

Insert Figure 1 about here

Insert Figure 2 about here

METHODOLOGY

Research Setting

We collected the data in Greece using four selection criteria which yielded an initial population of 748 small firms. These criteria were: (1) small firms belong to diverse sectors (e.g., retail, manufacturing, professional and other services); (2) have 10-49 employees in line with the European Union definition for small firms; (3) be owned by individuals (so they are not part of larger multinationals – thus assumed independent in their resources and their competitive strategy); (4) be registered ≥ 5 years. We used the last criterion to exclude start-ups/young firms as dynamic capabilities take time to materialize (Zahra *et al.*, 2006) and because the strategy-performance link becomes more stable and salient over time (Wiklund and Shepherd, 2005). The data collection effort took place sequentially in 3 parts (each with N=250 randomly allocated small firms) over about 6 weeks each, for manageability and quality control purposes. Given the nature of the target population (small firms) and size, we used the single respondent method. We solicited and collected the data from CEOs / small firm owners. We contacted the small firm CEO/owner by telephone to check if matching the study specifications and for their willingness to participate; in total, 710 accepted to receive the survey, a cover letter with details and instrument completion instructions and a prepaid return envelope. We subsequently contacted each participating small firm twice by telephone. Once, a week after sending the postal pack for confirming that they have received the questionnaire; second, a week later to prompt for instrument completion and posting. We eventually collected 143 responses, reflecting an effective response rate of 20%. Non-response bias tests used an extrapolation method (Armstrong and Overton, 1977) and two objective measures (namely firm age and firm performance) via one-way analysis of variance across early and late respondents, and respondents versus non-respondents, but these tests yielded insignificant F-values.

Participant self-reports, though a frequent method of studying decision-making has inherent limitations (Huber and Power, 1985) and multiple informants do reduce the impact

of these limitations (Kumar *et al.*, 1993). Nonetheless, in our case, the size of target firms suggests that CEO/small firm owners have a predominant, unique and non-substitutable role. This role refers to their ability to assess firm salient characteristics, ability referring to their experience and longevity, round, deep and comprehensive knowledge of the focus small firm.

Biases may exist. Social desirability bias is a source of error when utilizing self-reports as it introduces a systematic variance bias into assessing the constructs in question (Spector, 2006). Common method bias (CMB) can be a serious problem (Podsakoff *et al.*, 2003:879) reflecting variance attributable to the measurement method itself rather than to the measured constructs (Bagozzi and Yi, 1990; Bagozzi *et al.*, 1991) and it contains both a random and a systematic component (Spector, 2006), probably pronounced on specific performance measures (such as growth indicators). We used two procedures at the design stage to ensure a minimal impact of such biases. Following Podsakoff *et al.* (2003), the first procedure aimed to assure respondent anonymity. As second procedure, we separated items and construct measures within the research instrument, thus replicating procedural remedies undertaken elsewhere (Krishnan *et al.*, 2006; Parkhe, 1993). Scale anchors also varied and we reversed some to reduce and compensate for the formation of response patterns (Papadakis *et al.*, 1998). We also used four procedures post-hoc. First, we employed Harman's one factor test and found no one single factor. Second, we correlated subjective and objective measures of performance. A positive association of sufficient strength is apparent (see Appendix for details). Third, we checked whether respondents reporting relative firm performance consistently responded that their firm possesses adaptive capability. Fourth, and most important of all, it is our post-hoc test for endogeneity, which captures the effect of a potential CMB (CMB is a sub-case of endogeneity) (Antonakis *et al.*, 2010: 1096-1097). The results diminish concern for CMB issues (see Appendix for details).

Measures

Small firm performance outcomes used financial-sales turnover related performance indicators (market/financial performance: *MFP*) and new product performance (*NPP*) compared to the small firm's immediate competitors in their principal market over the last three years so to capture longer-term/more permanent outcome effects. Ten-point Likert scales were employed. *MFP* aspects represent widely utilised performance indicators in entrepreneurship research (e.g. Wiklund and Shepherd, 2005) as re-investment of financial resources into resource and capability development is possible. Items used were net and gross profit. Sales turnover which is the third indicator of the *MFP* measure capturing firm market performance (e.g. Brush *et al.*, 2000; Hoy *et al.*, 1992; Weinzimmer *et al.*, 1998). Without market or financial performance, small firms cannot fulfil their ambitions illustrating the dimension's integral nature but also enabling the demonstration of the impact of competitive strategy. *NPP* explicitly addresses small firm innovative activity (Kandemir and Acur, 2012). *NPP* items captured new product development performance in terms of market share, sales and customer use and profit objectives. These imply a proactive stance in anticipating emerging opportunities (Hughes *et al.*, 2007).

Adaptive capability (*Adapt*) (compared to the small firm's immediate competitors in their principal market over the last three years so to capture specific and permanent practices) was measured using Hughes *et al.*'s (2007) 3-indicator construct using 10-point Likert scales. These reflect whether the firm adapts adequately to changes in the business environment; reacts to market and environmental changes in a quick and satisfactory way; and responds promptly to new market opportunities. As explained in a previous section, our measure is not a performance reflection variable as in Hughes *et al.* (2007) start-up companies but an organizational element in our sampled mature small firms.

Competitive strategy. This is measured using Chandler and Hanks' (1994) three generic competitive strategy (including innovation, cost leadership and differentiation) construct.

Seven-point Likert scales were employed. Innovation strategy (*Innov*) items capture firm's capacity to have new products available, emphasis on new product development and novel marketing techniques. Cost leadership (*CL*) items capture cost reduction in operations, employee productivity and operation efficiency and lower production costs via process innovation. Differentiation (*Diff*) items capture emphasis on having high quality products and customer service in terms of strict quality control, meeting customer requirements, superior customer service, producing highest quality goods, meeting customer needs.

Environmental variables. We incorporated two control variables that attempt to capture the effects of the wider (principal industry level) technological and market environment effect (Miller and Chen, 1986; Porter, 1980). Lack of identifying an effect thereof indicates, in contrary, that strategy and adaptive capability operate at within-firm level and only in close proximity to immediate competitors in the principal markets, irrespectively of the divergence in the wider higher abstraction level environments firms face. We did this to distinguish between the wider and proximal environment. To increase the validity of the measures, we drew upon Miller's (1988:291) assertion that managerial action is directed towards specific issues and therefore we developed controls that capture narrowly defined aspects of the wider environment, applicable to the examination of small firms. Seven-point Likert scales were employed. **Technological Environment** (*Techno*) measure incorporates two items of Miller's (1988) environmental uncertainty scale and one item of the environmental dynamism scale, so to capture the small firm's principal industry's rate of

obsolescence, modes of production change and rate of innovation of new operating processes and new products or services. *Market Environment (Market)* based upon Miller's (1988) environmental heterogeneity and dynamism scales comprised two items of environmental heterogeneity and one item of the environmental dynamism scale, so to capture the small firm's principal industry's unpredictability for competitor's activities, customer tastes and preferences, downswings and upswings.

Measurement models

We first investigated the measurement model for the dependent latent constructs. Then, we investigated the measurement model for the independent latent constructs. We used the Exploratory Structural Equation Modelling (ESEM) procedure in Mplus (6.12). This procedure (Asparouhov and Muthén, 2009) simultaneously utilizes an exploratory (EFA) and confirmatory factor (CFA) analysis to avoid the numerous problems associated with the traditional two-step process (see Fornell and Yi, 1992 for these problems). Important advantages exist. The geomin-based rotation allows for cross-loadings and produces accurate estimates of underlying structures as it benefits from the simultaneous estimation of both EFA and CFA scores. The analysis produced a 2 first-order factors model for performance (*MFP* and *NPP*) and a 6 first-order factors model (*Techno*, *Market*, *Innov*, *CL*, *Diff*, *Adapt*) for the independent latent constructs (see Appendix Table 1). Cross-loadings were also small. The performance model indices are: χ^2 : 5.351; *df*: 4; *p*: 0.2531 (baseline model χ^2 : 2576.258; *df*: 15); RMSEA: 0.049; (CI 90% 0.000-0.143; *p*= 0.420; CFI: 0.999. The independent latent constructs' model fit indices are: χ^2 : 69.968; *df*: 60; *p*: 0.1777 (baseline model χ^2 = 7534.562; *df*: 153); RMSEA: 0.034 (90% CI: 0.000-0.064); *p*= 0.783; CFI: 0.999. All items load high and significantly on the designated constructs, and small cross-constructs' loadings are reflected in high Average Variance Extracted (AVE) and Construct Reliability (CR) estimates. AVE (and CR in parentheses) were: *MFP*: 0.64(0.83); *NPP*: 0.72(0.88); *Innov*: 0.66(0.85); *CL*: 0.59(0.80); *Diff*: 0.63(0.83); *Adapt*: 0.83(0.93). The AVE and CR scores for the environmental variables scored lower: *Techno*: 0.31(0.56); *Market*: 0.45(0.70)), but this was attributed to the diversity of the wider environments faced by the target small firms in their own respective industry sectors. SIC (squared inter-construct correlation) estimates were also small (0.34 for the performance and 0.01-0.14 for the independent constructs). The above and the theoretical support for the scales suggest

convergent, discriminant, face and nomological validity of the measures (Fornell and Larcker, 1981).

We subsequently constructed 8 new measurement error-free variables (2 dependent and 6 independent factors) in line with Papadakis *et al.* (1998) using the items loading high on each construct weighted by their respective loading. Interaction terms were subsequently also computed after centring the respective error-free variables. We subsequently proceeded to our structural models using multivariate regression (Stata 13.0). SEM estimation is not advisable due to small sample size (see though note in appendix). Table 1 (below) provides descriptive statistics, correlation coefficients, the AVE and CR scores (factor analyses results are in Appendix Table 1). Our sampled firms have employed a combination of competitive strategies usually termed ‘hybrid’ (e.g., Pertusa-Ortega *et al.*, 2009) (see note in Appendix).

Insert Table 1 about here

Structural models

To test:

a) the influence of competitive strategies/adaptive capability → performance, we estimated:

- Model M1A (controls only):

$$MFP = \beta_0 + \beta_1 \cdot \text{Techno} + \beta_2 \cdot \text{Market} + e_1$$

$$NPP = \beta_{10} + \beta_{11} \cdot \text{Techno} + \beta_{12} \cdot \text{Market} + e_2$$

- Model M1B (controls & competitive strategies):

$$MFP = \beta_{20} + \beta_{21} \cdot \text{Techno} + \beta_{22} \cdot \text{Market} + \beta_{23} \cdot \text{Innov} + \beta_{24} \cdot \text{CL} + \beta_{25} \cdot \text{Diff} + e_3$$

$$NPP = \beta_{30} + \beta_{31} \cdot \text{Techno} + \beta_{32} \cdot \text{Market} + \beta_{33} \cdot \text{Innov} + \beta_{34} \cdot \text{CL} + \beta_{35} \cdot \text{Diff} + e_4$$

- Model M1C (controls & adaptive capability):

$$MFP = \beta_{40} + \beta_{41} \cdot \text{Techno} + \beta_{42} \cdot \text{Market} + \beta_{43} \cdot \text{Adapt} + e_5$$

$$NPP = \beta_{50} + \beta_{51} \cdot \text{Techno} + \beta_{52} \cdot \text{Market} + \beta_{53} \cdot \text{Adapt} + e_6$$

c) the influence of control factors & competitive strategies → adaptive capability, we estimated:

- Model M2A (controls only):

$$\text{Adapt} = \beta_{60} + \beta_{61} \cdot \text{Techno} + \beta_{62} \cdot \text{Market} + e_7$$

- Model M2B (controls and competitive strategies):

$$\text{Adapt} = \beta_{70} + \beta_{71} \cdot \text{Techno} + \beta_{72} \cdot \text{Market} + \beta_{73} \cdot \text{Innov} + \beta_{74} \cdot \text{CL} + \beta_{75} \cdot \text{Diff} + e_8$$

d) the influence of control factors, competitive strategies and adaptive capability → performance (Model M3), we estimated:

$$MFP = \beta_{80} + \beta_{81} \cdot \text{Techno} + \beta_{82} \cdot \text{Market} + \beta_{83} \cdot \text{Innov} + \beta_{84} \cdot \text{CL} + \beta_{85} \cdot \text{Diff} + \beta_{86} \cdot \text{Adapt} + e_9$$

$$NPP = \beta_{90} + \beta_{91} \cdot \text{Techno} + \beta_{92} \cdot \text{Market} + \beta_{93} \cdot \text{Innov} + \beta_{94} \cdot \text{CL} + \beta_{95} \cdot \text{Diff} + \beta_{96} \cdot \text{Adapt} + e_{10}$$

e) the influence of control factors, competitive strategies, and adaptive capability and interaction effects → performance (Model M4), we estimated:

$$MFP = \beta_{100} + \beta_{101} \cdot \text{Techno} + \beta_{102} \cdot \text{Market} + \beta_{103} \cdot \text{Innov} + \beta_{104} \cdot \text{CL} + \beta_{105} \cdot \text{Diff} + \beta_{106} \cdot \text{Adapt} +$$

$$\beta_{107} \cdot \text{Adapt} * \text{Innov} + \beta_{108} \cdot \text{Adapt} * \text{CL} + \beta_{109} \cdot \text{Adapt} * \text{Diff} + e_{11}$$

$$NPP = \beta_{110} + \beta_{111} \cdot \text{Techno} + \beta_{112} \cdot \text{Market} + \beta_{113} \cdot \text{Innov} + \beta_{114} \cdot \text{CL} + \beta_{115} \cdot \text{Diff} + \beta_{116} \cdot \text{Adapt} +$$

$$\beta_{117} \cdot \text{Adapt} * \text{Innov} + \beta_{118} \cdot \text{Adapt} * \text{CL} + \beta_{119} \cdot \text{Adapt} * \text{Diff} + e_{12}$$

Insert Table 2 about here

RESULTS

H1 is confirmed. Adaptive capability accounts for a proportion of variance of performance outcomes which is either close or greater than double the one for competitive strategy (adjusted R^2 for adaptive capability versus competitive strategy are: 46% versus 17% for *MFP*; 42% versus 23% for *NPP*) (see Models M1B and M1C in Table 2). The standardised beta regression coefficients also become statistically non-significant for Cost Leadership (*CL*) or only a third (0.16-0.24 for Differentiation (*Diff*) or Innovation (*Innov*)) of the strength of the respective coefficient for adaptive capability (*Adapt*: 0.61-0.69). Wider environmental influences upon the effect of adaptive capability on performance outcomes were not statistically significant (see Model M1C), in line with expectations.

H2 is confirmed. As noted elsewhere (e.g., Kenny *et al.*, 1998; Simsek and Heavey, 2011: 92) to test mediation using the Baron and Kenny (1986) procedure includes five steps. Specifically, Step 1 requires that competitive strategy is significantly related to our performance variable; Step 2 requires that competitive strategy is significantly related to adaptive capability; Step 3 requires that adaptive capability affects performance while controlling for the effect of competitive strategy. Finally, when these conditions are satisfied, Step 4 requires that the effect of competitive strategy on performance decreases or becomes non-significant when controlling for adaptive capability in order to indicate mediation. We

estimate the effects in both Steps 3 and 4 in the same regression equation. Step 5 tests weaknesses of the procedure.

The analysis has shown Steps 1-4 to be satisfied (see Models M1B, M1C, M2A, M2B, M3 in Table 2) providing a base for accepting *H2*. Competitive strategy explained between 17% for *MFP* and 23% of *NPP* (adjusted R^2 - see Model M1B in Table 2). To note that *CL* significantly influences adaptive capability but its direct influence upon *MFP* and *NPP* is statistically non-significant. This is not surprising; in fact these results are in line with Campbell-Hunt (2000: 148) meta-analysis' findings. Including *Adapt* almost doubled the explanation of variance for both performance outcomes (to 46% for *MFP* and 42% for *NPP*) simultaneously rendering the influence of competitive strategy (*Innov*; *Diff*) statistically non-significant (see Model M3). Furthermore, adaptive capability' standardized beta regression coefficient ranged between 0.58 and 0.74 for *NPP* and *MFP* respectively (see Model M3), practically inferring that the explained performance is almost singularly affected by adaptive capability. Calculation of the indirect effect (ie)/direct effect (de)/ total effect (te) for competitive strategy channeled through adaptive capability also showed these to be: a) Innovativeness ie/de/te: 0.35/-0.08/0.27; b) Cost leadership ie/de/te: 0.34/-0.01/0.32; differentiation ie/de/te: 0.31/0.07/0.39. As our findings refer to a three-dimensional competitive strategy, our interpretation is that the strength of any single competitive strategy's causal influence channeled through adaptive capability is in fact, conditional on the influence of the two other studied competitive strategies.

Step 5 investigates weaknesses of the Baron and Kenny (1986) procedure. Hayes (2009) has raised power-related concerns which are specific to mediation or moderation. Lower the power, higher the probability of a Type II error occurring (Cohen, 1988). We calculated the power and did additional Montecarlo simulations, but the results largely appease any power related reservations in our study. We also tested for endogeneity effects

(see Antonakis *et al.*, 2010). Contrary to common held belief, standard exogeneity assumptions are insufficient for identifying causal mechanisms. This applies to the Baron and Kenny (1986) mediation approach too (Imai *et al.*, 2011, 2011). We conducted additional analyses to quantify the effects of ignored potential confounders and a sensitivity analysis to probe the extent of our assumptions. These results show that irrespectively of which competitive strategy we test, the average percentage of mediation (=indirect effect) compared to total effect substantially outperforms (by 77-131%) direct effects. These lend firm support to the initial results, so we deem our *H2* as confirmed. Step 5 tests' details are in the Appendix.

H3 is largely refuted. Data do not generally support the notion that adaptive capability accelerates and multiplies the influence of competitive strategy upon performance outcomes through *leveraging* and 'overclocking'. Adding interaction terms (see Model M4 in Table 2) increased explained variance but this impact was small (from 46% to 47% for *MFP* and from 41% to 44% for *NPP*). Our findings identify however a weak and partial moderation. Only the *Adapt*Innov* moderator has a single (beta coefficient of 0.27 of *Adapt*Innov* upon *NPP*) leveraging influence. The direct influence of competitive strategy has also dissipated. Adaptive capability's power is not reinforcing / 'overclocking' the power of competitive strategy *per se*. The leveraging only singly relates to an innovation related conditional mechanism upon *NPP* outcomes explaining merely an additional 1% of *MFP* and 3% of *NPP* (from 0.46 to 0.47 and from 0.44 to 0.47 respectively) explained variance.

DISCUSSION

We contribute to the ongoing debate and propose an enriched view of small firm adaptive capability. In doing so, we highlight the importance of small firm adaptive capability *per se* for superior performance and explain that this occurs through adaptive capability's dual role function and aim. We also shed light on the causal pathway small firm competitive strategy's impact upon performance outcomes is exercised in the presence of adaptive capability. These have important implications for theory and practice. We review these together with limitations and avenues for future research here below.

First, by answering our research question, we advance the ongoing debate on dynamic capabilities (e.g., Ambrosini *et al.*, 2009; McKelvie and Davidsson, 2009; Slater *et al.*, 2006; Wang and Ahmed, 2007), and their relationship with competitive strategy (Makkonen *et al.*, 2014; Ortega, 2010; Pertusa-Ortega *et al.*, 2009). We also complement Eriksson (2014) and Barreto (2010) on the links between antecedents and outcomes of small firm dynamic capabilities. In doing so, the articulation of dynamic capabilities as a theoretical platform for competitive edge (Zahra *et al.*, 2006) and higher importance ones like adaptive capability (Teece, 2012; Wang and Ahmed, 2007) is substantiated in our results. Our findings support the 'resource orchestration' perspective (Helfat *et al.*, 2007; Sirmon *et al.*, 2011) and adaptive capability appears to uplift the imprint of company assets and capabilities upon performance (in line with Danneels, 2002, 2008; 2012: 42) and organizational adaptive behaviour (in line with Makkonen *et al.*, 2014). In doing so, we purposefully expose the functioning of adaptive capability confirming Teece (2012) and also Makkonen *et al.*, (2014) who argue that specific dynamic capabilities, namely of adaptive nature, are very influential for success. Our work also provides an empirical test of our theoretical framework in contrast to much previous literature which is only conceptual in nature (e.g., Ambrosini *et al.*, 2009;

Eisenhardt and Martin, 2000; Teece, 2012; Teece *et al.*, 1997; Wang and Ahmed, 2007; Winter, 2003; Zahra *et al.*, 2006).

Second, our findings suggest that small firm adaptive capability explains why specific dynamic capabilities create differences in the impact of competitive strategy upon performance outcomes (Pertusa-Ortega *et al.*, 2009). It may not be the competitive strategy, but specific higher importance top-layer dynamic capabilities, at the heart of small firm renewal and success. In doing so, our findings reflect that proficiency of managerial – specifically entrepreneurial competences type action, in line with Teece (2012), matter most. Competitive strategy's influence upon performance does not take place in vacuum – it is intertwined to the proficiency of the decision-makers. This links adaptive capability back to the findings of several authors such as Papadakis *et al.* (1998). As a top-layer dynamic capability, adaptive capability proficiently connects for competitive strategy matters resources' possession and exploitation (Newbert, 2007; Zahra *et al.*, 2006). Furthermore, as one or few chief individuals can make the difference (Teece, 2012: 1395) this has substantial repercussions in small firms. It is the combined, interwoven, complementary and polarizing effect of adaptive capability at the heart of small firm renewal and success. In small firms, the one/few chief individuals who are entrepreneurially competent, effectively and efficiently simultaneously attenuate the resilient and negative impact of resource-based limits (e.g. McKelvie and Davidsson, 2009). In other words, adaptive capability regenerates, reconfigures and determines the way a firm adjusts to its proximal business environment changes while simultaneously offsets resource limits' impacts. Then, the small firm affirms augmented capability to adapt, respond and react and actions' impact is amplified yielding enlarged performance outcomes (Grewal and Tansuhaj, 2001; Krohmer *et al.*, 2002; Wang and Ahmed, 2007). In doing so, adaptive capability liberates and enacts incrementally the

small firm to achieve its transitory market competitive acts by proficiently implementing elements of competitive strategy, altering states, practices, routines and meta-routines, depending upon the task and the resources in hand. This happens irrespectively of the firm's much wider environment. In line with Barreto (2010), Makadok (2001), Makkonen *et al.*, (2014) and Zahra *et al.* (2006), the mechanism at work is a within-firm one that refers to proximal competition and principal markets only and not a between-firm one within a wider industry level. In small firms, this mechanism is enforced internally rather than being externally driven, operating as a self-governing apparatus. Adaptive capability acts from within the firm fabric eventually providing small firms with an organizing prism towards the market and a mindset for growth through constant 'morphing (Rindova and Kotha, 2001).

Third, our work extends Makkonen *et al.*, (2014). Their work used a measure for organizational change mostly capturing how to get organized (p. 2711). It is how proficient, effective and efficient the management action is when doing so that matters. This links back to the comment that the development of adaptive capability is often accompanied by the evolution of organizational forms (Wang and Ahmed, 2007: 37). Future research should test if our findings persist under multiple firm and industry variations, inter and intra-firm, variability and firm size. Studies should also look at the interface between adaptive capability and other proposed important dynamic capabilities (Wang and Ahmed, 2007). Our work advances Ortega (2010) who postulate that dynamic capabilities and strategy converse combining their effects to generate maximum impact. Adaptive capability actually alters both the conversing and exercising of competitive strategy upon performance outcomes. Acting beyond and above the impact of competitive strategy upon performance outcomes, adaptive capability handles and manages competitive strategy while adding its own denser weight. It transmutes the strength, and alters how small firm competitive strategy influences

performance outcomes; strategy effectively subsiding under proficiency of managerial action, although it simultaneously undertakes an additional secondary role reinforcing innovation strategy for specific performance outcomes (NPP) only. Future research should likewise examine this under multiple contexts and using longitudinal research designs.

Fourth, the channeling of strategy through adaptive capability to performance implies the masked effects of learning and knowledge capitalization. Although outside our present scope of interest, this effect appears embedded in our findings and should be explicit.

Makkonen *et al.* (2014) clearly mention that their focus small firm case study kept working with universities and monitoring consumer behavior (p. 2716). Learning enables to identify and flexibly change practices, routines and meta-routines. Extending Sirmon *et al.* (2010), future work may unfold the underlying link between foci of learning, learning processes, knowledge capitalization and adaptive capability.

Fifth, the study isolated particular mechanisms and manifested their simultaneous, causal impact advancing the pertinent theoretical and limited empirical knowledge (Anderson and Eshima, 2013). We have attempted to answer whether adaptive capability weakens/strengthens the influence of competitive strategy upon performance, or alternatively channel and transmute competitive strategy. Surprisingly, the theoretical and empirical knowledge of causal mechanisms explaining dynamic capabilities' functioning but also adaptive capability in small firms has been limited (e.g., Anderson and Eshima, 2013). Eriksson (2014) also commented that the mechanisms by which dynamic capabilities influence on outcomes are unclear (p. 73). Our work identified two simultaneous causal pathways exercised by adaptive capability (albeit the second pathway having only partial and weak effects). Our moderation findings align with past works (e.g., Song *et al.*, 2005; also

Ortega, 2010) who favor the moderating role of innovation related (marketing/ technological) dynamic capabilities. Yet, we find that this very small compared to its overarching mediation effect in support of Makkonen *et al.* (2014). Clarifying further the causal mechanisms at work substantively clarifies theory.

A separate investigation is needed if the interest is on the influences of the environment occurring through the formation of competitive strategies but dissipating later in the process. Unarguably, the use of a causal language here may also raise methodological questions. By embracing a relevant analytical procedure, we made a modest effort to measure endogeneity effects (Antonakis *et al.*, 2010). Multiple competing viewpoints exist though and research should identify best practice.

Sixth, small firm management practice appears to be able to reap increased success by focusing on adaptive capability skills and abilities so to make the most with the resources they already have in hand rather than singly-minded focus on success stemming from the choice of competitive strategy *per se*. Adaptive capability enables small firms to defend niches and aim for growing those market niches (Wiklund, 1998) through effectiveness and efficiency irrespectively of their wider environment by building a mindset for proficient management. This in small firms allows high returns, much higher than choice of competitive strategy alone.

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Biographical note:

George Chrysochoidis* is currently Professor of Marketing at Kent Business School, University of Kent. Having worked in the areas of new product launch and innovation, he is essentially a modeler concentrating on choices/ decision-making and development of innovative quantitative methodologies. His work has benefited public policy and marketing action and has had important societal and public policy impact. He has published 49 peer reviewed articles. George Chrysochoidis, University of Kent, Kent Business School, Canterbury, CT2 7PE, Email: g.chrysochoidis@kent.ac.uk

* Corresponding Author

Dimitrios Dousios is Lecturer in Entrepreneurship, Norwich Business School. His work investigated the linkages between entrepreneurship, dynamic capabilities and small business growth and was fully funded by the Greek State Scholarship Foundation (IKY). His research and teaching interests revolve around entrepreneurship and enterprise creation, with particular focus on high technology start-ups, born-global firms and early stage entrepreneurship. Dimitrios Dousios, University of East Anglia, Norwich Business School, Norwich NR47TJ, Email: d.dousios@uea.ac.uk

Nikolaos Tzokas is currently Executive Dean, Faculty of Business, University of Plymouth. His research portfolio consists of three areas, namely new product development, relationship marketing, and sales management. The common denominator, which navigates and focuses this research portfolio, is the development of our understanding on how the competitiveness of contemporary firms can be enhanced by means of joint value creation i.e. knowledge created and used through close collaboration among firms, customers, suppliers and other stakeholders. He has published over 43 peer reviewed articles. Nikolaos Tzokas, Plymouth University, Faculty of Business, Drake Circus, PL4 8AA, Email: Nikolaos.Tzokas@plymouth.ac.uk

APPENDIX

Factorial analysis

Appendix Table 1 provides the results of the ESEM procedure.

Insert Appendix Table 1 about here

Competitive strategies adopted by our sample firms

To better understand what competitive strategies our sampled firms reported, we plotted the scores of the SEM based factors. The surface plot (not included here) indicated that our sampled firms employed a combination of competitive strategies, understood to be termed ‘hybrid’ (Pertusa-Ortega *et al.*, 2009). Based on Chandler and Hanks’ (1994) definition, we also clarify that our definition of competitive strategy of the sampled firms captures direction of strategy rather than realised strategy (e.g., Mintzberg and Waters, 1985).

Common-method bias concerns

We also randomly selected 20% of our sample (N=28) and sought firms’ publicly published performance indicators for 3 years prior to our data collection. Yet, we were mindful that such figures may be distorted due to Greek small firm active tax evasion practices, that distortions may vary per sector and that distortions may primarily center on reported profitability. We used a specific type of correlation analysis which caters for non-equidistant observations, namely MIC (maximum information coefficient) focusing on the strength of the association between self-reported *MFP* and a ratio based on small firms’ past 3 years’ publicly reported MFP figures (we computed this ratio as: $\log \text{Year3 turnover} / \log \text{turnover Year1}$). MIC belongs to a novel family of correlation coefficients and is suitable for graphically complex associations (see Reshef *et al.*, 2011; 2013). Our MIC estimation for the association between MFP and our computed ratio (using the MINE algorithm available for R)

was .32 which for N=28 we interpreted following Reshef *et al.* (2011) and Reshef *et al.* (2013) guidance as denoting sufficient strength of a positive association. We treat this correlation between ‘subjective’ and ‘objective’ data and reflective of diminishing concerns for CMB. It is our post-hoc test for endogeneity (see further below) which captures the effect of a potential CMB (Antonakis *et al.*, 2010: 1096-1097). The method of obtaining data from different sources to minimize CMB is satisfactory as long as the focus variables are exogenous. If the focus variables are endogenous, as in our case, even data from different sources are not immune to CMB. Only an endogeneity test caters for biases –including CMB, because it quantifies the effects of ignored potential confounders. To note that these objective data cannot replace our subjective measures as they are only the publicly available figures for the companies and they do not confirm what operations they refer to and accounting rules they obey.

In parallel, we also wanted to check whether respondents reporting relative firm performance consistently responded that their firm possesses adaptive capability, another aspect of CMB. We considered that such CMB would likely be captured as a progressive linear surface between MFP/NPP and adaptive capability (the greater the MFP/NPP the greater the adaptive capability). We visually examined the 3D plot of their relationship but clear lack of a progressive linear surface was evident. These and the results of our tests for endogeneity (see further below) seem to lend support to our belief that CMB are minimal.

Mediation-analysis power concerns

Power-related concerns, specific to mediation analysis exist and merit specific investigation (e.g., Hayes, 2009). Given our small sample size, similar to much extant research in the area (e.g. Simsek and Heavey, 2011), some of the mediational influences we detect may suffer power consideration issues. We employed Sobel-Goodman (see Sobel,

1982) mediation test and it showed that in all our cases any mediation of adaptive capability influence to be statistically significant and complete ($p > |Z|$ values < 0.000). Yet, power analysis (at .80 level) (Cohen, 1988) with specific reference to Sobel's test (this is a complete mediation case ($\tau' = 0$)), indicates that the influence of innovation competitive strategy mediated through adaptive capability is detectable with any sample above $\sim N = 130$ for beta coefficients of small medium size for the independent and large for the mediator.

This is our case ($b_{Innovation} \rightarrow Adaptive\ capability = 0.22-.024$ and $b_{Adaptive\ capability} \rightarrow MFP/NPP = 0.61-.69$), and the same occurs for the impact of differentiation upon MFP ($b_{differentiation} = 0.22$). The figures are characterized of less power regarding the detection of differentiation upon NPP ($b_{differentiation} = 0.16$) given this smaller beta coefficient, but they, on the other hand, benefit from small measurement error (see Fritz and MacKinnon, 2007: 8). The above power consideration estimates refer to the entire mediated path. As power increases, the chances of a Type II error occurring decrease. The probability of a Type II error occurring is referred to as the false negative rate (β) (Cohen, 1988). Therefore power is equal to $1 - \beta$ and regards the proportion of a condition in a sample testing positive for it. Thus, the influence of all competitive strategies as detected in the initial results indicates varying probability of detection given different degrees of power due to sample size constraints. These initial results are not sensitive enough to confirm detection of all mediation influences. The mediated impact of innovation (on MFP and NPP) and differentiation (on MFP) is being detected with greater certainty than the one by cost leadership on both MFP and NPP, and differentiation on NPP.

To remedy this and further examine potential implications including questions that some researchers answer through bootstrapping, we conducted a Montecarlo-based simulation using the regression coefficients of Model M3 for the estimation. Results indicated that for over $N = 100000$ replications the coefficients converge for all variables to

the same values as the ones in Model M3 ($p < 0.001$; 95% coverage) for both MFP and NPP and reflect power > 0.80 . This may permit to infer that the mediation effects may also attain strong power which in turn may allow us to decrease such reservations in our study.

Actual impact and power considerations of the interaction term(s)

There is an additional issue, namely what is the *actual* impact of the interaction *Adapt*Innov*. Since at least one interaction $\neq 0$, the direct effect from *the Adapt*Innov specific* interaction upon performance carries out, in fact the influence of the *intercept* of the competitive strategies' influence upon adaptive capability (=that is the *intercept* of the regression of adaptive capability upon each competitive strategy), plus importantly, the influence of *each* competitive strategy upon adaptive capability channeled to performance outcomes through the *Adapt*Innov* interaction's direct effect upon performance. Model M2B gives an indication of the strength of the influence of *each* competitive strategy upon adaptive capability. Related, a comment on the standardized coefficient $b_{Adapt*Innov} = 0.27$ for the interaction *Adapt*Innov* compared to $b_{adaptive\ capability} = 0.62$ for adaptive capability (see Model M4 in Table 2). The power of $b_{Adapt*Innov}$ is ~ 0.52 using as base for the estimation: 9 predictors; standardized values; VIF: 2.51; $p < 0.05$ which is of medium strength. To test this, we conducted an additional Montecarlo simulation using Model M4 figures. Similar results were exhibited; for instance the power of findings in the simulation for *H3* is > 0.80 .

Endogeneity concerns

Much of past research implicitly assumes 'causal independence' (Imai *et al.*, 2009; Imai *et al.*, 2011a, 2011b; Pearl, 2009), an issue also discussed under endogeneity (see Antonakis *et al.*, 2010). Standard exogeneity assumptions are insufficient for identifying causal mechanisms and this also applies for the traditional Baron and Kenny (1986)

mediation analysis (Imai *et al.*, 2009). Importantly, the traditionally used instrumental variable approaches (e.g. Bascle, 2008) do not apply in a mediation framework (Pearl, 2009). Methods to deal with endogeneity in mediation models are, at present, in progress but we use the latest thinking holding the view that future progress will provide further guidance on best practice. In doing so, we test our results assuming ‘sequential ignorability’ in a mediation modeling framework, so to identify the causal mechanisms, identify the strength of potential confounders, and conduct a sensitivity analysis to probe the extent of our assumptions.

The critical sequential ignorability criterion refers to more than one aspect. First, as noted above, it refers to the possible existence of non-measured mediators which may affect both *Adaptive capability* and *MFP/NPP*. Our mediator (*Adaptive capability*) was *not* randomly selected and we should not preclude the possibility of other mediators. Next, our selected ‘*treatment*’ (each competitive strategy) encountered in our observational study may not be random, *given the covariates* (Imai *et al.*, 2009, 2011a, 2011b). A competitive strategy can essentially be treated random only after adjusting for observed pre-treatment covariates and that the assignment of the mediator values is also essentially random once both the observed competitive strategies and the set of observed pre-treatment covariates are adjusted for (Imai *et al.*, 2009, 2011a, 2011b). Furthermore, even when the competitive strategy (*treatment*) and adaptive capability (*mediator*) are randomized, we cannot identify the mediation effects unless an additional assumption, namely a no-interaction effect between treatment and mediator constraint is imposed (Imai *et al.*, 2009, 2011a, 2011b; Robins, 2003).

For this purpose, we employed Imai *et al.*’s (2009, 2011a, 2011b) *medeff* and *medsens* procedures (implemented in Stata). This procedure requires an independent variable that can be used for the estimation of confounding. We selected three separate variables, namely *Market* and *Techno* which may be of primary, plus a third variable in our dataset which can be of secondary, importance so to also investigate the range of divergence of estimates. The

latter variable, namely firm location (*Location*) (question item= your performance in your main market against your direct competitors is due to your location) is conceptually outside the current framework. We expected location to be correlated with all factors in our framework, but also be of peripheral importance. We considered these three factors equivalent to Imai *et al.* (2009, 2011a, 2011b) ‘*pre-treatment*’ confounders and thus, they may be understood as what happens regarding the mediation and outcome when a competitive strategy is assigned to be as the one observed. We employed the original treatment factor as a continuous variable and the procedures predict the mediator M_i (*Adapt_i*) for treatment case values of $T_i=0$ and $T_i=1$ (e.g., 1=very innovative/ cost leadership/ differentiation; 0=not innovative/ cost leadership/ differentiation), and Y_i with $T_i=1$ and \widehat{M}_i (0). Imai *et al.*‘s (2009, 2011a, 2011b) procedure quantifies the (degree of) sequential ignorability violation as the correlation of mediator-outcome error terms. Then calculates the values of the Average Causal Mediation Effect (ACME) for values of a sensitivity parameter, ρ (the correlation in error terms). Findings are deemed *sensitive* if the effects vary widely as function of ρ computed for ACME =0. In addition, the product of R^2 for the mediator and outcome model at which ACME=0 is also assessed using the proportions of residual or total variance in the mediator and outcome the hypothesized unobserved confounder explains. The sensitivity procedure also creates the low and high bounds using a 95% confidence interval for ACME (see Appendix Table 2).

Adjusted R^2 for the mediation regression is 45-46% for MFP and 41-42% for NPP. The regression coefficient for *Adaptive capability* spans 0.46-0.57 for MFP and 0.45-0.49 for NPP; like in the original analysis competitive strategies do not retain statistical significance. ACME spans 28-35% (95% confidence intervals spanning 18-49%). ρ at ACME=0 spans 50-64%; $R^2_M * R^2_{Y^*}$ (=the upper bound of sensitivity) at which ACME=0 spans 25-41% and $R^2_{M\sim} * R^2_{Y\sim}$ (=the lower bound of sensitivity) at which ACME=0 spans 7-17%.

Sensitivity is reflected by *rho* (see $\text{Rho@ACME}=0$ in Table 2), but the results also show that *even* for the lower bound of sensitivity, mediation effects are produced. The lower bounds of sensitivity specifically regard the original variance *unexplained* by the confounder(s) which, in reverse, is what is actually the *most conservative* estimation of the model variance explained by the model variables. In *average*, and after having tested for confounder effects, the percentage of mediation compared to total effect spans 79-131%, much in favor of the argument that adaptive capability does indeed act as a mediator.

Insert Appendix Table 2 about here

It is important to add that these positive mediation effects occur irrespectively of *which* competitive strategy is tested and irrespectively of the employed confounder, even though the strength of the mediation and confounder influences does vary. These lend firm support to the initial results, so it appears that our *H2* is eventually indeed confirmed.

Using a SEM framework

We have not used SEM because of the small sample size ($N=143$) which may distort SEM results. Nonetheless for the same of completeness we also subjected our main models (Model 3 and 4) to a MLR based estimation using Mplus 7.3. Fit was excellent ($\chi^2: 312.130$; $df: 224$; $p: 0.0001$ (baseline model $\chi^2: 2053.544$; $df: 276$); RMSEA: 0.052; (CI 90% 0.038-0.066; $p=0.376$; CFI: 0.95 but also SRMR: 0.061). Coefficients were stronger than what we report in our main paper for Model 3, namely: MFP and NPP on adaptive capability standardized beta coefficient: .82*** and .61*** respectively all others remaining statistically non-significant. In Model 4 the interaction of innovativeness on NPP was also almost same and significant (.29**) confirming our extant analysis.

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