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**Polychronicity in New Technological Venture Teams:  
The Influence of Founder-CEOs' Tertius Iungens Orientation and the Implications for  
Venture Growth**

Abraham Carmeli, Yan Ling, Li-Qun Wei, and Jun Xia

**ABSTRACT**

Team polychronicity, or a team's preference to engage in multiple events simultaneously, in new ventures has attracted increasing research attention. However, research on the antecedents that cultivate the polychronicity of new venture teams (NVTs) and the boundary conditions under which NVT polychronicity influences new ventures' outcomes has remained underdeveloped both theoretically and empirically. Delving into new technological ventures, we address these issues by developing and testing a model in which founder-CEOs' tertius iungens orientation (TIO) is suggested as an antecedent and new technological venture growth as an outcome of NVT polychronicity, particularly in industries with abundant growth opportunities. The findings based on founder-CEOs and NVT members from 79 new technological ventures lend support to our arguments and offer theoretical insights to the research of NVT management.

**Keywords:** Founder-CEO, *tertius iungens* orientation, polychronicity, new technological venture growth, new venture team.

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## 1 INTRODUCTION

To effectively compete in the fast-changing technology environment, firms in general, and new technological ventures in particular, need to adjust plans and activities continuously and promptly [28], [39], albeit many of them start with a detailed roadmap for achieving growth [28]. The new venture teams (NVTs), or “the group of individuals that is chiefly responsible for the strategic decision making and ongoing operations of a new venture” [61], bear substantial responsibility to attend and process the fast-changing strategic information and lead firms to adapt. To fulfill this role successfully, these entities must be able to cope with time constraints, not only because of the uncertain conditions they need to respond to but also because new technological ventures lack the organizational structure and resources (e.g., a multidivisional structure, support personnel) common in large firms that can assist top executives on information processing and strategic decision-making [37].

This inherently temporal challenge has propelled scholarly attention to the temporal patterns of NVTs—how they devote and allocate energy and time to deal with emerging and unexpected changes. Some scholars adopt an attention-based view, which points to the attention of top executives as a key cognitive capacity that enables firms to pursue strategic planning and adaptation [6], [23]. They particularly highlight the importance of NVTs’ polychronicity, defined as the extent to which NVTs “prefer to be engaged in two or more events simultaneously and are actually so engaged” [12]. Highly polychronic NVTs have been found to shift attention in ways that allow them to incorporate unpredicted events into planned activities and engage in diverse tasks at the same time [92]. This type of NVTs tend to attend to unforeseen events while running planned activities (e.g., continuously improving the reliability of the current product design or satisfying established customer base) [56], [63]. In contrast, NVTs with low levels of polychronicity tend to interpret events falling outside of the scheduled tasks (e.g., customers’

unexpected request for a new product feature or a new technology emerging on market) as interferences to be avoided. Considering the different workstyles, these scholars suggest that polychronicity is conducive for NVTs' time and energy allocation, especially when dealing with unforeseen events [63], [92]. The tendency to shift attention and work on multiple tasks simultaneously allows the team to better counter increased workload that arise with unexpected changes [56]. Further, members of polychronic NVTs have more chances to engage in self-learning by transferring knowledge and experiences from one activity or project to another [63]. The self-learning would enable the team to respond to uncertainties more efficiently.

Despite the suggested desirability of polychronicity for NVTs' time management, two fundamental issues have remained underdeveloped. First, while observations reveal that "there is variation in polychronic orientation" among teams [92], the question of why some NVTs are more polychronic than others is yet to be answered. Research suggests that founder-CEOs, who form and lead NVTs, hold a unique position in influencing the teams' processes and capabilities at a level that is hardly reached by CEOs in established firms [62], [68]. Given this, it is imperative to understand if founder-CEOs have an effect in cultivating the polychronicity of NVTs. Although some studies have pointed to the behavioral orientation of team leaders as potentially influential on team-level polychronicity [56], [92], [99], this possibility has not been specifically examined.

Second, the strategic implications of NVT polychronicity, particularly regarding whether and why the influence of NVT polychronicity may vary across environmental conditions, have yet to be fully examined. Except for an empirical study that linked NVT polychronicity to firm-level outcomes (return of assets and sales) [92], it remains unclear if and in what conditions NVT polychronicity facilitates other strategic objectives of new ventures. Notably, new technological

ventures are subject to the liability of newness: in the absence of stronger growth compared to major competitors, their chance of continued survival tends to be questioned and be of investors' and public's concerns [54]. Accordingly, a key question concerns whether and under what conditions NVT polychronicity contributes to new venture growth in general [8], and new technological venture growth in particular.

We intend to address both issues by providing a study that examines the antecedents and outcomes of NVT polychronicity simultaneously. First, we link NVT polychronicity to a novel behavioral orientation of founder-CEOs, *tertius iungens* orientation (TIO), defined as a strategic behavioral orientation that induces the actor to introduce disconnected individuals to one another, or to facilitate and strengthen coordination between connected people [45], [81]. Although management scholars have begun exploring TIO, the primary focus is its influence on individual-level outcomes with relatively limited attention to the team- and firm-level consequences of leaders' TIO [60]. An exception is Wei et al.'s recent study [102] that found a positive association between single founders' TIO and the financial performance of new ventures. Different from their study, in which the focus on single founders' TIO canceled the opportunity to examine the influence of TIO on team-level work orientation, we focus on the TIO of founder-CEOs in NVTs. Evidence shows that most new ventures are founded and led by teams, rather than by individuals [61], [62]. We theorize that one benefit associated with founder-CEOs' high levels of TIO in these prevalent team-founded new ventures is the promoted polychronicity among NVT members. With this premise, we next expand the nomological network of NVT polychronicity by linking this team-level work orientation to new technological ventures' growth. To add precision, we further specify why this link varies depending on the opportunity available in the external environment, represented by industry growth.

The current article extends the understanding of polychronicity, a work orientation recommended for NVTs, by specifying how it can be better cultivated and when it brings clearer value in new technological ventures. This extension is important in that it enriches the knowledge about NVT management, especially about how to promote flexible and effective time use among NVT members and in what industry environment such promotion is crucial.

## **2 THEORETICAL BACKGROUND AND HYPOTHESES**

### **2.1 New Venture Team Polychronicity**

The concept of polychronicity was originally introduced by Hall [48] as a cultural dimension of preferred temporal patterns of behavior. It is essentially a preference for multitasking and viewed as a "fundamental life strategy representing underlying core assumptions about time usage" [77]. At the team level, polychronicity is conceptualized as a type of team-level work orientation that can be cultivated [12], [99]. As team members interact with each other over time, they are likely to develop shared beliefs and preferences regarding how to order projects and activities temporally in their team [15], [56].

Team polychronicity is a continuum with infinite degrees, ranging from absolutely low levels of polychronicity (project A is started and finished before project B is begun, project B is started and completed before project C is begun) through extremely high levels of polychronicity (pause project A and start project B, pause project B and return to project A, pause project A and start project C; or work on projects A, B, and C literally at the same time) [16]. Switching attention among projects should, however, not be considered as simply moving back and forth with each project focused on monochronically. Instead, this switching involves the team's

"simultaneous interspersing or dovetailing" of multiple projects through the complementary use of team members' time, skills, and energy [11], [59], [90].

Expanding on the attention-based view [44], [84], Souitaris and Maestro [92], who focused on NVTs in technology firms, stressed that the essence of the polychronicity construct in the strategic setting is an "attention structure." Under this structure, NVTs stay flexible and spontaneous; their members consider unscheduled projects as part of normal activities rather than as interruptions or deviations from the project at hand [92]. Scholars have long suggested that strategic decision-making in new technological ventures is characterized by a dynamic and fast workflow, with various uncertainties to be navigated [43]. For instance, because the firms' products are new to the market and without precedent, their reliabilities have yet to be established [4]. Due to the lack of extensive past data, market demand and buyers' responses are hard to predict [28]. Further, in the underserved sectors that these ventures newly identify, definite technology trends or standards often have not formed [58]. Consequently, it is crucial for new venture managers to constantly learn and adjust, allowing a wide range of events to appear and demand attention [36]. Moreover, unlike large firms where strategic information processing and decision-making are aided with extensive resources (e.g., supporting personnel), new technological ventures lack such essential work resources [80], [96]. Thus, NVT members are required to direct and channel their attention to expected and unexpected demands themselves. The substantial demand on NVTs' time and energy calls for polychronicity [53], a work orientation that, while involving potential cost (e.g., disturbing involvement) [1], can enable the teams to develop bandwidth and be more responsive to changes [63].

Nevertheless, research suggests that polychronicity is not easy to develop [13]. First, to become polychronic, an NVT needs to be well connected with various outside parties (e.g., firm

members, suppliers, customers, other firms, and governments), because this connectivity enables the team to develop awareness of strategic stimuli and feel the need to switch attention between unpredicted changes and projects at hand or literally address them simultaneously. As Bluedorn and Denhardt [13] noted, if changes occur in environments but top managers do not sense them, teams will perceive the environments erroneously and be less likely to attend to them while processing ongoing projects. Second, polychronicity requires substantial coordination among team members [93]. With mutual coordination and adjustment, the resources within the team—chief among which is the limited time and energy of team members—can be synchronized and leveraged in the right place at the right time. This way, the team perceives expanded capacity to agilely switch attention and engage as needed between multiple tasks and projects [14].

Then, who can help NVTs with connection and coordination? Given their central power position, CEOs typically have a significant influence over top management teams [69]. In a new technological venture where the entity is less bureaucratically complex and the founder–CEO leads the NVT since inception, he or she should have a more substantial influence on team members and their work orientation [68]. Building from this notion, we highlight a personal trait proposed by networking researchers, TIO, which refers to an actor’s orientation to bring together and coordinate others [94], [87]. Unlike the recent study focusing on TIO of single founders who work as the sole active driver of new ventures [102], we concentrate on TIO of founder-CEOs, who work with NVTs to jointly create and manage new ventures and share strategic decision-making. We propose that founder-CEOs with high levels of TIO are more likely to help NVTs with connection and coordination, thus promoting polychronicity within the team. We next elaborate on this argument.



## **2.2 Founder–CEO TIO as an Antecedent of New Venture Team Polychronicity**

TIO is a strategic behavioral orientation with which a network actor tends to bridge parties with various knowledge, demands, or opinions, and to coordinate their relationships over time [81]. The term “orientation” suggests a dispositional preference that one develops while approaching problems in a social context [81], [64]. Since individuals act in ways consistent with their predispositions [95], a key assumption in TIO research is that this orientation motivates individuals to really behave so [82]. In this regard, Obstfeld [81] emphasized that TIO encompasses two relational qualities: 1) exposing and connecting disconnected individuals to each other, and 2) facilitating new communication between individuals who are already connected or strengthening existing coordination between them. Accordingly, in leading NVTs, TI-oriented founder-CEOs should have a strong tendency not only to bridge NVT members to diverse parties inside and outside the firm, whom they may or may not be preconnected with but also to help in the coordination within the teams.

These connection behaviors that founder-CEOs tend to undertake should be conducive to the development of polychronicity in NVTs. First, research shows that TI-oriented individuals’ connection behaviors do not facilitate continuous connections in a superficial way; instead, they connect people with superior information exchange involved [60], [82]. This theorizing suggests that when founder-CEOs with high levels of TIO actively bridge NVT members with other people within and outside the firm and reinforce the connections between NVT members, they consciously and unconsciously source information from various domains to flow into the team. The information from diverse sources is likely to expand NVTs’ scanning emphases, increasing their exposure to strategic stimuli that are potentially challenging and urge their attention [38]. With the intensified exposure to interrupting strategic stimuli brought by founder-CEOs’ TIO

becoming the teams' work routine, the NVTs are likely to be induced to often switch attention back and forth and gradually become accustomed to it. Over time, the NVTs are likely to develop a stronger preference to work in a polychronic manner.

Second, TI-oriented founder-CEOs can facilitate the within-team coordination conducive to team-level polychronicity. TI-oriented individuals are active at strengthening ties and creating reciprocity between actors who are already connected [81]. As Obstfeld et al. [83] pointed out, TI-oriented individuals have strong social skills in that they play an ongoing facilitating role and have the capacity to detect and link different interests among individuals, so that the otherwise uncoordinated parties have a strong willingness to support one another [82]. This type of integration is crucial to NVTs' development of polychronicity because many top management teams consist "primarily of solo operators" [50]. In this regard, we see founder-CEOs with strong TIO as "sustained iungens" [81], who can mitigate the integration difficulty in NVTs. Through the connections intensified by TI-oriented founder-CEOs, NVT members have more opportunities to communicate, coordinate, and be attentive to each other. As suggested by team process research [49], [91], the frequent communication promotes close support and mutual adjustment among team members. Some scholars have named this type of close integration "positive social capital," [5] which expands the generative capacity of people and of the teams they compose by allowing the removal of unnecessarily duplicated efforts on the one hand and better problem solving on the other hand. All of this suggests that with TI-oriented founder-CEOs' ongoing facilitation, NVT members are likely to be closely coordinated and mutually supported, and as a whole the team would have expanded capacity to work on multiple projects or activities at the same time [98]. Thus,

**Hypothesis (H1):** *Founder-CEOs' tertius iungens orientation is positively associated with new venture team polychronicity.*

### **2.3 Growth Performance Implications of New Venture Team Polychronicity**

How much value may NVT polychronicity yield in new technological ventures? Scholars generally point to the positive side, albeit the potential cost [56], [63], [92]. Specifically, psychology research informs us that constant intrusions could create mental workload that stifles involvement in projects and thus potentially lead to reduced quality of work [52], [55]. Indeed, several studies have found a negative link between individual-level polychronicity and deadline-meeting and punctuality [7], [26]. However, at the team level and from the attention-based perspective, scholars suggest that in new technological ventures, where rapid strategic decision-making is crucial, the negative consequence of polychronicity is likely to be outweighed by the core benefit of this article orientation—promoting the spontaneity of NVTs in steering the ventures to navigate the fermented and changing environment [3], [63]. Supporting this view, an empirical study that tied NVT polychronicity to firm-level outcomes indicated a positive link between NVT polychronicity and new technological ventures' performance [92].

We follow this positive view about NVT polychronicity and extend it by showing that this team-level work orientation may contribute to another strategic objective of new technological ventures—firm growth [22]. Firm growth is grounded in the capture of growth opportunities [29]. However, not all growth opportunities are suitable or cost efficient for a firm [79]. New technological ventures often struggle with resource constraint and cannot afford costly mistakes [80], [96]. They need to filter and process environmental information and on this basis select the right (i.e., more cost efficient) opportunities and exploit them to successfully grow [43].

We suggest that polychronic NVTs are more likely to help the firms to accomplish this growth objective. Scholars studying polychronicity have noted that this work orientation allows teams to integrate diverse ideas and achieve cross-fertilization, which is essential to efficient information processing and creative problem solving [12], [90]. The reason is that the exposure to multiple projects associated with team-level polychronicity promotes consideration of distant information and provides the chances for the teams to scan different ideas regularly and quickly [56]. Applying this quality of polychronicity to strategic decision-making, researchers have explicated that highly polychronic NVTs enjoy a type of decision-making advantage [92]. They can test, transfer, and integrate ideas from a broad range of projects [56], [72]. The information generated by the cross-fertilization of diverse projects is then woven into unique and deep interpretations [3]. As such, NVT polychronicity is considered to facilitate nonsystematic, but timely, acquisition of insightful intelligence (which denotes information quality rather than quantity) [92]. Supporting this view, evidence has shown that a key benefit of NVT polychronicity is that it promotes strategic decision speed [92].

This decision-making advantage derived from working polychronically is conducive for new technological ventures' growth. NVTs' consideration of multiple projects allows the firm to quickly attend to and acquire insights about unexpected growth opportunities. When an unexpected change emerges, attending to the new event by working polychronically while dealing with planned projects gives NVTs a chance to test and sort out if the change and projects in hands share something in common, whether they can make great use of similar resources, or if one bears higher growth potential to pursue than the other. As such, the firm has less possibility to miss out on opportunities, and more likelihood to identify cost-efficient opportunities and convert them into concrete actions that foster firm growth. In contrast, NVTs low on

polychronicity would try one opportunity at a time. Because of the holdup, the firms might eventually find some unexpected opportunities (e.g., expanding into new markets or new technologies), which they later deem as valuable for firm growth, no longer available or, even if still available, the best timing to leverage the opportunities in a cost-effective 363 manner has passed. Thus,

**Hypothesis (H2):** *New venture team polychronicity is positively associated with new technological venture growth.*

## **2.4 Moderating Role of Industry Growth**

Although NVT polychronicity enables new technological ventures to be nimble in exploiting growth opportunities, such an advantage may not be universal. Temporal scholars have hinted that the functionality of a specific time use orientation is contingent on its suitability to environments [42]. Bluedorn et al. [17] state that “Flexibility in one situation may lead to the exploitation of an unanticipated opportunity, but in other situations, it may lead to unproductive dithering.” This is in line with the downside of polychronicity suggested by psychological research on mental workload [52], [55]. Indeed, Bluedorn et al. [16] conceptualize that polychronicity may be better suited for situations where the challenge of information processing is substantial. This contingency, however, has not been empirically examined. We adopt this view and hypothesize that the link between NVT polychronicity and new technological venture growth is contextual and, specifically, depends on the level of industry growth.

We theorize the potential moderating role of industry growth for two reasons. First, our research model focuses on firm-level growth of new ventures as the outcome. Although many new technological ventures share the desire to grow, strategic management literature suggests

that firm leaders do not have total discretion over their decisions; whether they can successfully transform their firms' potential into real growth depends, at least in part, on the level of alignment between the firms' resources (in our case, NVT polychronicity as a resource conducive to new technological venture growth) and external environment (in our case, the allowed growth opportunity in the industry) [24], [89]. Second, industry growth is an important indicator of information complexity [30], [70]. It reflects a fast-growing demand in the industry that not only attracts many new entrants to join the competition but also stimulates existing competitors' strong desire to expand and grow [65], [73]. As such, in high-growth industries, competitive structure evolves rapidly [97], and the structural volatility provides a wide and complex variety of emerging opportunities to analyze, even within an overarching technical design or when firms have only limited resources to reconfigure [33]. This circumstance would shorten the wavelength implied in the environment and reinforce the demand for new technological ventures to actively adjust choices and identify the "right" paths to growth [2].

Accordingly, we argue that the functionality of NVT polychronicity for new technological venture growth would be more salient in fast-growing industries. The cognitive variety and cross-fertilization of ideas from diverse projects associated with NVT polychronicity can help the firms to better exploit the abundant opportunities in the industry and update their sources of growth in a more cost-efficient way. In contrast, slow-growing industries offer more stable environments where the number of unforeseen opportunities awaiting analysis is smaller. In these industries, NVTs may not be able to fully leverage the benefits of their polychronicity to optimize the pursuit of firm growth [52]. In fact, in low-growth industries where technological and market changes are relatively rare, growth opportunities reside more in firms' leverage and strengthening of existing routines and markets [88]. As such, strategic decision-makers' deep

understanding of established knowledge is important in this circumstance [57], whereas this requirement is to some extent in compatible with the back and forth switching associated with polychronicity. The frequent interruptions could reduce the depth and concentration [76], which are essential to NVTs' sharpening of existing knowledge [88]. Following this reasoning, we expect that the detrimental effect of polychronicity could be exacerbated in slow-growing industries, which offsets the hypothesized benefit of this work orientation for firm growth. Accordingly, we expect that the positive influence of NVTs' polychronicity on firm growth is more salient in fast-growing industries than in slow-growing industries. In sum, we further posit that the indirect relationships between founder-CEOs' TIO, NVT polychronicity, and new technological venture growth is moderated by industry growth. Thus,

**Hypothesis (H3):** *The positive relationship between new venture team polychronicity and new technological venture growth is stronger when growth opportunity in the industry is higher.*

**Hypothesis (H4):** *The indirect relationship between founder-CEOs' tertius iungens orientation, new venture team polychronicity, and new technological venture growth is moderated by industry growth.*

### **3 METHOD**

#### **3.1 Sample and Data Collection**

We collected data from NVTs in China. We eliminated very small new ventures (fewer than ten employees) because founder-CEOs there basically acted as sole founders [10]. Firm age was no more than ten years. We collected data in four major cities (Beijing, Shanghai, Guangzhou, and Chengdu) located in northern, eastern, southern, and western China, respectively. According to the data registered at Science Park Administrative Bureau in each city, we identified a pool of

new technological ventures that met the aforementioned criteria. A random number generator was then used to randomly select 800 firms. The firms were contacted by phone, and 450 firms expressed interest to participate in the survey. Ten trained research assistants were assigned to visit the founder-CEOs of these firms. The founder-CEOs were asked to identify all the members currently in the NVT. Data collected from these firms showed that 71% of NVT members joined the team since firm inception.

Since the measures were originally developed in English, a commonly utilized back translation procedure was applied to ensure that the translation was accurate [19]. Complete surveys were obtained from the founder-CEOs and all NVT members in 152 firms (Time 1). A year later (Time 2), we sent a follow-up survey to the 152 firms. To maximize the rigor of the measure, we required the founder-CEO and at least one other NVT member to complete the follow-up questionnaires. Ninety firms returned the follow-up survey, but eleven had incomplete questionnaires and were dropped from the sample. These stringent criteria led to a final sample comprising 79 firms, 17.6% of the 450 firms surveyed or 9.9% of the 800 firms in the original sampling frame. This response rate was comparable with the 10.12% rate typical for studies that target top executives [40], [27]. The responses were collected from all members in 79 NVTs, including 79 founder-CEOs and 167 non-CEO team members. On average, the founder-CEOs were 41 years old and had 18 years of education. Seventy-four percent were male. We compared early-returned and late-returned questionnaires on a number of variables (team size, firm age, firm size, and industry). An ANOVA test indicated that early-responding and late-responding firms were similar, implying that nonresponse bias was minimal.



### 3.2 Measures

*New technological venture growth* (measured in Time 2 by founder-CEO and at least one more NVT member). Operationalizing the growth of new ventures is always a challenge because objective data are rarely available. Following prior studies [20], [66], [101], we used managers' self-assessments to quantify this variable. Dess and Robinson [31] have long suggested that subjective ratings about performance-related information are closely related to objective performance data. Zahra [104] found a significant correlation between the subjective measure of corporate entrepreneurship with Miller's [74] corporate entrepreneurship index and an objective indicator consisting of a firm's R&D spending, number of new products, and sales growth.

To better capture the time-lagged influence of NVT polychronicity, we lagged new technological venture growth by one year. Following Baum et al. [9], we asked respondents to compare their new venture's growth with that of their major competitors in the past year on five aspects (see Appendix). Responses were given on a seven-point scale ranging from 1 (much lower) to 7 (much higher). Since this variable was measured by the founder-CEO and at least one other NVT member, we utilized the inter-rater reliability coefficient ( $r_{wg}$ ) to examine the intragroup reliability of responses.  $R_{wg}$  greater than or equal to 0.70 is an indicator of good agreement within a group [41]. Statistical checks indicated high inter-rater agreement within each firm (average  $r_{wg} = .91$ ) and justified the aggregation of respondents' scores. We also assessed  $ICC(1)=0.45$  and  $ICC(2) = 0.79$ . Accordingly, we used the average of scores to represent a new technological venture's growth. The Cronbach's alpha was .91.

To further test the accuracy of our subjective measure of new technological venture growth, we obtained the objective data on annual revenue from the Administration Bureau for Industry and Commerce for the 15 firms that were listed in the database and calculated their revenue

growth as an objective measure—one year growth between Times 1 and 2. We compared this objective measure with our survey measure of new technological venture growth based on Spearman’s test, which is nonparametric. The correlation of the two measures was positive and significant ( $r = .62$ ,  $p < .01$ ), indicating the convergent validity of our subjective measure.

*Founder-CEO tertius iungens orientation* (CEO-TIO) (self-evaluated by the founder-CEO in Time 1). TIO was rated by founder-CEOs using a six-item scale developed and validated by Obstfeld [81] (see Appendix). Obstfeld [81] stressed that the scale was developed “to capture a predisposition to bring people together in collaboration, including introducing disconnected others and forging stronger ties between others who may already have ties with one another.” Our self-assessment approach is consistent with Obstfeld’s intended use of the scale and other studies on TIO [60]. The founder-CEOs responded on a five point scale ranging from 1 (strongly disagree) to 5 (strongly agree). The reliability was .80.

*New venture team polychronicity* (evaluated only by non-CEO team members in Time 1). In line with recent studies [92], we assessed team polychronicity using a concise five-item scale (see Appendix) on a five-point Likert format from 1 (strongly disagree) to 5 (strongly agree). Two items were reverse-scored. The average intragroup reliability ( $r_{wg}$ ) was 0.91. The ICC (1) and ICC (2) were 0.41 and 0.78. We thus averaged team members’ scores within each firm. Since polychronicity is a construct not used often, we did exploratory factor analysis to assess the validity of the scale. The result revealed that the two reverse-scored items did not load cleanly on the factor (with loadings below 0.40). Researchers alert that reverse wording of questionnaire items could introduce ambiguities, leading to measurement error [103]. Our post-hoc test among 138 MBA students showed that, again, the two reverse-scored items did not load

cleanly on the factor whereas the other three did. Given this, we excluded the two weak items from subsequent analyses. The reliability of the three-item measure was 0.79.

To further validate this three-item measure, we followed the procedure described by Bluedorn et al. [16] and Souitaris and Maestro [92] and did a known-groups test for content validity in a new sample of 88 managers studying at an executive MBA program. We used the two opposing scenarios suggested by Souitaris and Maestro [92] to describe a top management team very high on polychronicity and a top management team very low on it. We split our sample into two equal-sized parts. Each participant had to read one scenario (high or low) and answer to the 3-item scale as top management team members in the scenario would. The mean difference between the two scenarios on the 3-item scale was highly significant ( $t = 7.51, p < .001$ ), providing evidence of the content validity of the scale.

*Industry growth* (objective data). Data on industry growth came from the China Economic and Social Development Statistics Database, which provides comprehensive information about various industries in China. We collected the annual sales data of each industry that our sample firms located in for the three consecutive years before T2. The sample firms represented various technology industries, with 27% in computer software, 27% in electronics, 15% in advanced materials, 12% in medical and surgical equipment, 10% in telecommunications, and the rest (9%) in other industries such as environmental technologies, semiconductor, and industrial chemistry. We calculated two year-over-year growth rates by first subtracting the earlier year from the later year and then dividing the change by the earlier year's sales. We then averaged the two year-over-year growth rates, and the result represented the industries' growth trend in 586 the three-year period. Industry growth rates ranged from -10% to 210%, with a mean of 55%.

*Control Variables (Time 1):* We controlled five variables at founder-CEO and NVT level. Since education background may influence leaders' behaviors, we controlled the years of founder-CEOs' education. We controlled for firm age (the number of years) and firm size (the number of employees) as these firm characteristics have been linked to firm outcomes [21]. Since founder-CEOs' friendship with other NVT members may act as a confounding variable influencing the effect of founder-CEO TIO, we asked founder-CEOs to self-assess their level of friendship with every non-CEO NVT member, from 1 (no friendship) to 5 (very close friendship), and we then averaged it. We also controlled for an NVT process variable that has been suggested to influence new technological venture growth—dissent, namely, the divergence in the opinions of team members concerning the proper course of action [74]. TMTs with dissenting members move less uniformly and thus may impede firm growth [35], [100]. Following prior studies [32], we used the two-item scale to measure dissent, by asking all NVT members (including founder-CEOs) the extent to which the team members openly expressed differences of opinions during the decision-making process (1 = strongly disagree to 7 = strongly agree). The  $r_{wg}$  was .85 and ICC (1) and ICC (2) were 0.35 and 0.71. The Cronbach's alpha of the aggregated measure was .74. Given that it was a two-item scale, we also checked its Spearman Brown coefficient [34]. The coefficient was .75, supporting the reliability of the measure.

We also tested the effect of founder-CEOs' age, size of NVT, the mean of all non-CEO team members' TIO, level of slack reported by founder-CEOs, and industry types. These variables did not have a significant influence on any of the tested models. For parsimony, we did not include them in the results reported in this article. Detailed results with these controls are available upon request.

## 4 ANALYSES AND RESULTS

### 4.1 Confirmatory Factor Analysis, Descriptive Statistics, and Analysis Results

The data for this study were collected from multiple respondents and multiple sources (survey and database), and in a time-lagged manner. All this helped minimize common method variance [85]. We conducted a confirmatory factor analysis of the key multi-item variables. Table 1 shows that the three-factor model fitted the data significantly better than alternative models. Further, we checked if the violation of the normality assumption caused major problems in our sample. We used Lilliefors corrected Kolmogorov-Smirnov test and Shapiro-Wilk test. The results showed that most variables followed a normal distribution, but three control variables did not: firm size (mean=62.94; S.D.=75.72), CEOs' education (mean = 18.90; S.D. = 1.91), and CEOs' friendship with other team members (mean = 3.01; S.D. = .939). Thus, these three variables were log-transformed to achieve normality. Table 2 reports the means, standard deviations, and correlations of our variables. Multicollinearity appears not a concern, as the variance of inflation factors, ranging from 1.05 to 1.51, were lower than the threshold of 10 [47]. The variables used as the components of the interaction term were first mean-centered.

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**Insert Tables 1 and 2 about here**  
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We used hierarchical regression analyses to test hypotheses 1–3. Model 1 in Table 3 shows the influence of the covariates on team polychronicity, and we added CEO-TIO in Model 2. The results demonstrate that CEO-TIO had a significant positive effect on team polychronicity ( $b=.22, p=.013$ ), supporting H1. Table 4 presents the results when new technological venture growth was the dependent variable. The results of Model 3 support H2, showing a positive link between NVT polychronicity and new technological venture growth ( $b = .49, p = .008$ ).

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**Insert Tables 3 and 4 and Figure 1 about here**  
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Model 4 shows that the moderator, industry growth, was not significantly associated with new technological venture growth. Model 5 suggests that H3, predicting that industry growth strengthens the relationship between NVT polychronicity and new technological venture growth, is supported ( $b = .52, p = .041$ ). Following Cohen et al.'s [25] guideline, we found that team polychronicity was positively related to new technological venture growth when industry growth was high ( $p < .001$ ), but not significantly related when industry growth was low (see Fig. 1). To test H4 that industry growth moderates the indirect relationship among founder-CEOs' TIO, NVT polychronicity, and new technological venture growth, we applied bootstrapping regression with PROCESS [51], which addresses small sample concern and avoids power problems introduced by asymmetric and other non-normal distributions when testing mediation and moderation effects [71], [86]. This approach has been validated by many studies [18]. We utilized PROCESS Model 14 with 5000 times resampling. Table 5 shows that the association between CEO-TIO, NVT polychronicity, and new technological venture growth was not a traditional mediation model given that TIO (bootstrap coefficient =  $-0.243$ ,  $SE = 0.134$ ,  $95\% CI = [-0.510, 0.024]$ ) did not have a significant direct influence on new technological venture growth, and the index of moderated mediation was  $0.113$  with a bootstrap confidence interval including zero ( $95\% CI = [-0.034, 0.283]$ ). Instead, the results suggest an indirect relationship. In the upper half of Table 5, CEO-TIO was associated with NVT polychronicity (bootstrap coefficient =  $0.218$ ,  $SE = 0.085$ ,  $95\% CI = [0.048, 0.387]$ ), and NVT polychronicity was associated with new technological venture growth (bootstrap coefficient= $0.556$ ,  $SE=0.181$ ,  $95\% CI = [0.196, 0.917]$ ). The lower half of Table 5 shows that the indirect association among CEO-TIO, NVT polychronicity, and new technological venture growth was conditioned upon industry

growth. It was significant when industry growth was high (bootstrap coefficient = 0.214, SE = 0.123, 95% CI = [0.001, 0.461]) or at the mean level (bootstrap coefficient = 0.121, SE = 0.074, 95% CI = [0.001, 0.291]), but insignificant when industry growth was low (bootstrap coefficient = 0.047, SE = 0.056, 95% CI = [-0.039, 0.181]). This supported H4.

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**Insert Table 5 about here**  
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## 4.2 Robustness Tests

We conducted additional robustness analyses. First, we checked the standardized residual of each observation and did not find any case with a value over 3. Thus, our results were not driven by a small number of outliers. Second, we tested the hypotheses by excluding the founder-CEO from the assessments of new technological venture growth and found similar results. Third, while we theorize founder-CEOs' TIO as an antecedent of NVT polychronicity, one may speculate if the two variables interact. We tested this possibility by treating founder-CEOs' TIO as a moderator between NVT polychronicity and new technological venture growth. The result did not support this view ( $b = -.05$ ,  $p = .413$ ). Fourth, to assess if founder-CEOs' TIO is more utilized to promote NVT polychronicity in a high-growth industry, we tested the moderating role of industry growth in the association between founder-CEOs' TIO and NVT polychronicity. The interaction was not significant ( $b = -.01$ ,  $p = .932$ ). Fifth, we examined whether NVT polychronicity had a nonlinear effect on new technological venture growth. In the model that replicated Model 3 in Table 4, we added the quadratic term of NVT polychronicity. The quadratic variable did not have a significant coefficient ( $b = -.21$ ,  $p = .343$ ). Thus, the linear specification appeared to appropriately capture the relationship between NVT polychronicity and new technological venture growth. Finally, to rule out the possibility that it is the congruence between founder-CEOs' TIO and other NVT members' TIO that makes influence, we calculated

the similarity between the two variables and examined its relationships with NVT polychronicity and new venture growth and did not find statistically significant results.

## **5 DISCUSSION**

This article focuses on polychronicity in NVTs, a subject of inquiry that is only at nascent stages of development both theoretically and empirically. To this end, we examined the relationship between founder-CEOs' TIO and NVT polychronicity, and the condition under which NVT polychronicity is associated with new technological venture growth. Our findings of multisourced data from NVTs showed that founder-CEOs' TIO was positively associated with NVT polychronicity, and NVT polychronicity was positively associated with new technological venture growth, and the latter link was stronger in fast-growing industries.

### **5.1 Theoretical Implications**

This article advances the extant knowledge on NVT management in several ways by directing research attention to NVT polychronicity. First, it adds two timely extensions about NVT polychronicity. One is about antecedents. Although polychronicity has been described as desirable for NVTs' time management, prior research has not specifically investigated why some NVTs are more polychronic than others [63]. The paucity of research on this topic leaves an important puzzle unaddressed: how can new technological ventures do something to promote flexible and effective time use in their NVTs? Our article takes the lead to help on this end. Our findings that founder-CEOs' TIO was positively associated with NVT polychronicity are encouraging. It supports the cultivability of NVT polychronicity that some researchers have suggested [12], [99] and pinpoints founder-CEOs as a potential driver behind the cultivation. The



other extension is about consequences of NVT polychronicity. Although studies have found NVT polychronicity to be positively associated with firms' financial performance [92], it has remained unclear what other significant impact NVT polychronicity has on new technological ventures. Our research shows that NVT polychronicity also affects another strategic outcome—new technological venture growth. Further, this relationship was found to be significant when industries grow fast, but not significant when industry growth is below the average. Together, these results expand the nomological network of NVT polychronicity and, at the same time, broaden the discussion of NVT polychronicity from whether it is desirable to delineating conditions under which this complex work orientation of NVTs is more or less crucial.

Second, our discussion contributes to research on NVT management by distinguishing founder-CEOs from the rest of the team, different from those studies that view an NVT as a whole and consider the founder-CEO as a regular member of the NVT [3], [92]. Although several scholars have applied this distinction and illustrated how founder-CEOs' leadership styles influence NVT characteristics such as cohesion and advice-seeking orientation [67], our article extends by being the first to discuss how founder-CEOs influence NVT members' time and energy allocation. This extension suggests temporal perspective as another dimension that founder-CEOs may shape NVTs about. Future researchers are encouraged to follow this direction and provide additional insight into the relationship between founder-CEOs' personal traits or leadership behaviors and NVTs' temporal characteristics (e.g., temporal depth, temporal focuses) [78].

Third, our study links TIO to NVT management, thus expanding the scope of application of this unique networking orientation in the new venture context. While prior studies have suggested that TIO benefits entrepreneurs' individual-level innovativeness [81], our article

suggests another reason why TIO, as a personal trait, is important for entrepreneurs. That is, TI-oriented entrepreneurs may act more effectively as founder-CEOs in cultivating polychronic NVTs and, indirectly, foster new ventures' growth. This indirect relationship between founder-CEOs' TIO, NVT polychronicity, and new technological venture growth also extends the direct link that Wei et al. [102] recently found between single founders' TIO and new venture performance. It suggests that compared to single founders' TIO, founder-CEOs' TIO might have a more indirect influence on firm-level outcomes because of the team nature of strategic decision making in their team-founded ventures—passed through its effect on NVTs. This is a potential difference worth future researchers' consideration when discussing the influence of firm leaders' TIO in different types of new ventures. Finally, our article enriches the research about NVT management by highlighting the importance of the fit between executives' temporal characteristics and external clocks set by environmental factors. Although this fit has been stressed by some temporal scholars [78], it has not gained attention in the studies about NVTs. Our results constitute a first step in adopting this view in the context of new technological ventures. Importantly, our finding that industry growth moderates the relationship between NVT polychronicity and new technological venture growth indicates that the influence of NVT polychronicity is not as universally beneficial as some previous research has implied [63], [92]. Accordingly, this article generates new theoretical insights by proposing “key moderators with important theoretical and empirical implications” for the managerial work of NVTs [92].

## **5.2 Implications for Managerial Practices**

A key implication of our results for new technological ventures concerns the difference in NVT polychronicity and how this complex work orientation might be cultivated. When

entrepreneurs are to establish new ventures, they may need to consider selecting a CEO possessing sufficient TIO to lead the NVT, especially if the new venture will compete in a fast-growing industry. Our finding that NVT polychronicity has a more pronounced association with new venture growth in higher growth industries may help NVTs better plan their work. NVTs should realize that building a highly polychronic team is not universally beneficial. Before committing substantial efforts to develop this complex work orientation, founder-CEOs should analyze its appropriateness for the firm by paying attention to industry environments. If they have choices, NVTs led by TI-oriented founder-CEOs should avoid low-growth industries because in such industries their leaders' ability to facilitate team level polychronicity does not necessarily lead to desired effects or clear competitive advantages. This kind of assessment can help founder-CEOs more effectively manage NVT members' efforts and time, for avoiding unnecessary exploitation of these valuable and limited resources.

### **5.3 Limitations and Directions for Future Research**

This article has several limitations. We studied TIO as a theoretically relevant founder-CEO personal trait. It might be possible that founder-CEOs' TIO does not affect NVTs' polychronicity alone. For example, while our robustness test ruled out the effect of TIO congruence between the founder-CEO and the rest of NVT, research may benefit from examining if founder-CEOs' TIO and other NVT members' TIO interact to influence NVT polychronicity or new venture growth, a topic beyond the scope of our study. Besides industry growth, it would be meaningful to examine if any other environmental conditions could strengthen the upside and minimize the downside of NVT polychronicity so that new technological ventures can reap more value from it. For instance, polychronicity may be more beneficial in certain ownership structures, or in times

involving external shocks where regular strategies or routines are severely undermined. Our empirical examination focused on NVT sin team-founded new technological ventures, but future research may examine whether our model is generalizable to management teams in less technology-based new ventures, larger firms, or teams at lower levels (e.g., project teams). Also, given that the NVTs in our study were relatively stable (data showed that all team members had been in position for at least three years), it would be interesting to examine the potential influence of turnover (exit and entry of team members) on the proposed relationships. Our study focuses on firm growth as the outcome variable. A broader range of outcome variables can be examined to more completely understand the value of founder-CEOs' TIO and NVT polychronicity. We also believe that integrating NVT polychronicity with the emerging form of task-enabling leadership can enrich the understanding of task and time management in new technological ventures [46], such that the knowledge of why and how NVT polychronicity influences new technological ventures can be enhanced. We acknowledge that the measurement of polychronicity did not allow us to capture the various aspects of this complex work orientation. Future research may use observational methodology. Also, the measure of new technological venture growth was subjective. Although we cross-validated our measure by using some sample firms' objective data, an objective measure of this outcome variable would help strengthen this line of study. Our sample size was relatively small, which could constrain the generalizability of our findings. We hope future research could complement our study and provide larger sample tests. Finally, given that founder-CEOs' TIO and NVT polychronicity were measured at the same time, one may concern their reverse causality. It is noteworthy that we examined founder-CEOs who created NVTs. The possibility of NVT polychronicity to influence founder-CEOs' TIO was low. That said, one should be cautious when interpreting the

results because we allude to a causal model, but did not follow changes over time, even though we collected data at two-time points. A well-designed longitudinal study could better reflect the temporal dynamics.

## **6 CONCLUSION**

We enhance the understanding of NVT polychronicity by focusing on founder-CEOs' TIO as an antecedent and new technological venture growth as an outcome. We also examine the moderating role of industry growth, explaining the conditions in which NVT polychronicity may be more crucial for growth at the firm level. Our findings enrich research on NVT management by providing insights on how to promote the flexible and effective time use of NVT members and when and why such a promotion is particularly beneficial.

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**Table 1.** Results of Confirmatory Factor Analysis

Model	$\chi^2$	Df	$\chi^2/ Df$	TLI	CFI	RMSE
<b>Three-factor model</b>						
CEO-TIO, NVT polychronicity, new technological venture growth	69.99	74	.95	.99	.99	.01
<b>Two-factor model</b>						
CEO-TIO and NVT polychronicity combined, new technological venture growth	203.75	73	2.79	.73	.78	.15
NVT polychronicity and new venture technological growth combined, CEO-TIO	282.06	73	3.86	.60	.66	.20
CEO-TIO and new technological venture growth combined, NVT polychronicity	257.55	73	3.53	.62	.69	.18
<b>One-factor model</b>	324.12	77	4.21	.52	.60	.21

**Table 2.** Means, Standard Deviations, and Correlations

	Mean	s.d.	$\alpha$	1	2	3	4	5	6	7	8
1 CEO's education (ln)	2.93	.11									
2 Firm size (ln)	3.67	.87		.09							
3 Firm age	7.43	1.97		-.18	.26*						
4 CEO's friendship with other NVT members (ln)	1.06	.30		.14	-.18	-.29*					
5 Dissent	5.08	.81		-.10	.05	.12	-.27*				
6 <b>New technological venture growth</b>	4.94	.64	.91	.22	.24*	.16	.20	-.29**			
7 <b>Polychronicity</b>	2.55	.42	.79	.29**	.14	-.15	.10	-.29**	.35**		
8 <b>CEO-TIO<sup>a</sup></b>	3.66	.59	.80	.21	-.19	-.18	.13	-.42***	.01	.38**	
9 <b>Industry growth</b>	.55	.73		-.01	.01	.01	.13	.05	.04	.04	-.16

Notes:  $N = 79$ ;  $\alpha$  represents reliability coefficients when available; \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ ; Unstandardized regression coefficients are reported.

<sup>a</sup> TIO = *tertius iungens* orientation; <sup>b</sup> Team = new venture team

**Table 3.** Regression Results for New Venture Team Polychronicity

	Team Polychronicity					
	Model 1			Model 2		
	B	SE	P	B	SE	P
Constant	2.43	0.64	.000	2.46	0.72	.047
CEO's education	0.05	0.02	.039	0.04	0.02	.110
Firm size	0.01	0.01	.148	0.00	0.00	.052
Firm age	-0.03	0.03	.298	-0.02	0.02	.379
CEO's friendship with other NVT members	-0.01	0.05	.899	0.00	0.05	.979
Dissent	-0.14	0.06	.020	-0.07	0.06	.235
<b>CEO-TIO</b>				0.22	0.09	.013
Adjusted R <sup>2</sup>	.13			.19		
F (R <sup>2</sup> )	3.25*			4.02**		
ΔR <sup>2</sup>	.19			.07		
F (ΔR <sup>2</sup> )				6.57*		

Notes:  $N = 79$ ; two-tailed test; \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ ; <sup>a</sup> TIO = *tertius iungens* orientation; <sup>b</sup> Team = new venture team; Unstandardized regression coefficients are reported.

**Table 4.** Regression Results for New Technological Venture Growth

	Model 1			Model 2			Model 3			Model 4			Model 5		
	B	SE	P	B	SE	P	B	SE	P	B	SE	P	B	SE	P
Constant	3.75	0.96	.000	4.37	1.13	.000	3.66	1.12	.002	3.67	1.12	.002	3.55	1.10	.002
CEO's education	0.06	0.04	.095	0.07	0.04	.066	0.05	0.04	.166	0.05	0.04	.169	0.05	0.04	.172
Firm size	0.01	0.00	.047	0.00	0.00	.078	0.00	0.00	.235	0.01	0.01	.241	0.00	0.00	.237
Firm age	0.07	0.04	.050	0.07	0.04	.064	0.08	0.04	.028	0.08	0.04	.029	0.08	0.04	.033
CEO's friendship with other NVT members	0.14	0.08	.068	0.14	0.08	.079	0.14	0.08	.068	0.14	0.08	.068	0.13	0.07	.076
Dissent	-0.21	0.09	.018	-0.25	0.10	.010	-0.21	0.09	.022	-0.21	0.09	.024	-0.21	0.09	.021
<b>CEO-TIO</b>				-0.14	0.13	.299	-0.16	0.14	.174	-0.20	0.15	.167	-0.24	0.18	.179
<b>Team polychronicity</b>							0.49	0.18	.008	0.49	0.18	.009	0.55	0.18	.003
<b>Industry growth</b>										-0.01	0.09	.837	-0.02	0.09	.835
<b>Team polychronicity * Industry growth</b>													0.52	0.25	.041
Adjusted R <sup>2</sup>	.19			.19			.26			.27			.31		
F (R <sup>2</sup> )	4.59***			4.02**			4.81***			4.15***			4.35***		
ΔR <sup>2</sup>	.24			.01			.07			.01			.04		
F (ΔR <sup>2</sup> )				1.09			7.36**			0.04			4.33*		

	<b>Paths</b>					
	<b>to Team Polychronicity</b>			<b>to New Technological Venture Growth</b>		
	<b>B</b>	<b>SE</b>	<b>95% bootstrap CI</b>	<b>B</b>	<b>SE</b>	<b>95% bootstrap CI</b>
<b>CEO-TIO<sup>a</sup></b>	0.218	0.085	(0.048, 0.387)	-0.243	0.134	(-0.510, 0.024)
<b>Team Polychronicity</b>				0.556	0.181	(0.196, 0.917)

Notes: N = 79; two-tailed test; \* p < .05, \*\* p < .01, \*\*\* p < .001; <sup>a</sup> TIO = *tertius iungens* orientation; <sup>b</sup> Team = new venture team. Unstandardized regression coefficients are reported.

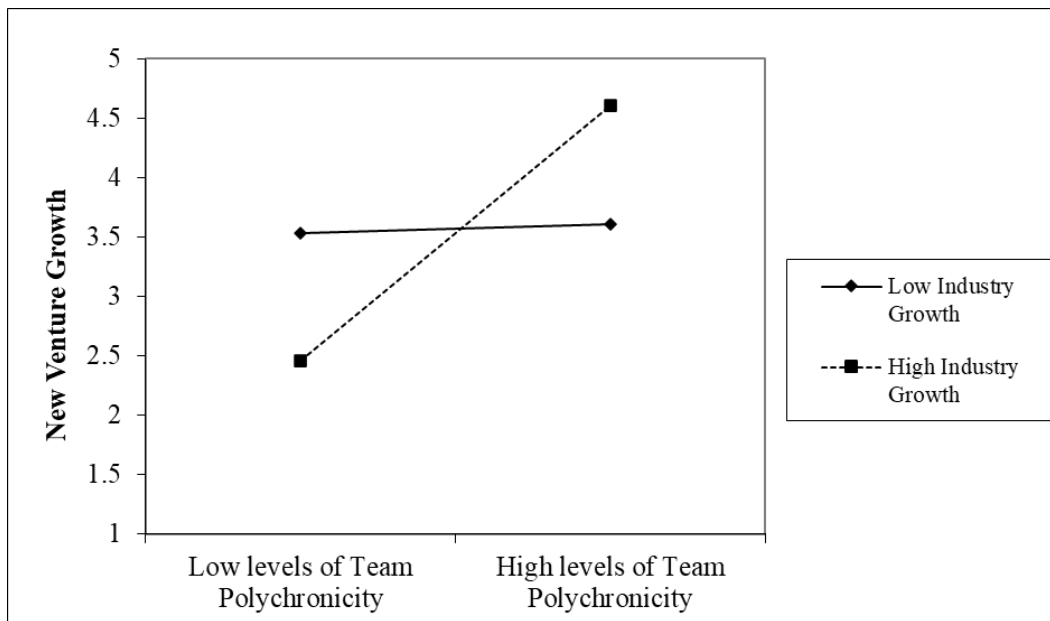
**Table 5.** Conditional Indirect Effect of Founder-CEO TIO on New Technological Venture Growth Through New Venture Team Polychronicity

<b>Indirect Effect</b>	<b>Moderator<sup>a</sup></b>	<b>B</b>	<b>SE</b>	<b>95% bootstrap CI</b>
CEO-TIO → Team Polychronicity → New Technological Venture Growth	Low, -1 SD	0.047	0.056	(-0.039, 0.181)
	Mean	0.121	0.074	(0.001, 0.291)
	High, +1 SD	0.214	0.123	(0.001, 0.461)

*Notes:* <sup>a</sup> Moderator = industry growth. *N* = 79. Unstandardized regression coefficients are reported. Bootstrap sample size = 5,000, CI = confidence interval.



**Figure 1.** Moderating effect of industry growth on the relationship between new venture team polychronicity and new technological venture growth



## Appendix: Measures of Main Variables

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### *Founder-CEO tertius iungens orientation*

- I introduce people to each other who might have a common strategic work interest.
- I will try to describe an issue in a way that will appeal to a diverse set of interests.
- I see opportunities for collaboration between people.
- I point out the common ground shared by people who have different perspectives on an issue.
- I introduce two people when I think they might benefit from becoming acquainted.
- I forge connections between different people dealing with a particular issue.

### *New venture team polychronicity*

In our team ...

- We believe people should try to do many things at the same time.
- We would rather focus on one project each day than on parts of several projects. \*
- We tend to juggle several activities at the same time.
- We think it is best and tend to complete one task before beginning another. \*
- We believe it is best for people to be given several tasks and projects to perform simultaneously.

### *New technological venture growth*

- Growth in revenue
- Growth in R&D spending
- Growth in the number of non-R&D employees
- Growth in the number of dedicated R&D employees
- Growth in patenting rate

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*\* These items were reverse scored. They were excluded from the final analyses because of the weak loadings in factor analysis.*