The Development of Individual Ambidexterity Across Institutional Environments: Symmetric and Configurational Analyses

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Abstract

Buoyed by recent calls for research to explore micro-level cognitive explanations for ambidexterity, this study examines how individuals' self-efficacy and resilience affect individual ambidexterity across different institutional environments. Building on social cognitive theory, we posit that self-efficacy enhances ambidexterity via resilience and that such relationship varies across economic institutional environments. Our symmetric (PLS-SEM) and configurational (fsQCA) analyses of 1907 knowledge workers in China, New Zealand and Australia provide supportive and complementary evidence for these theoretical arguments. Specifically, PLS-SEM reveals that the mediating effects of resilience on the relationship between self-efficacy and individual ambidexterity are stronger in an environment where economic institutions are weak. fsQCA complements PLS-SEM by showing that individual ambidexterity can be explained by multiple configurations of psychological self-efficacy, resilience, characteristics related to institutions, and personal demographic factors. Taken together, these findings contribute to the international business literature by providing a nuanced understanding of how different psychological resources integrate and interact with institutional factors to enhance individual ambidexterity.

Keywords Self-efficacy · Resilience · Individual ambidexterity · Economic institutional environments

1 Introduction

Individual ambidexterity conceptualised as the individual's capability to simultaneously pursue exploration and exploitation (Tempelaar & Rosenkranz, 2019) lies at the micro-foundation of organisational ambidexterity (Gibson & Birkinshaw, 2004;

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Kauppila & Tempelaar, 2016). However, due to the trade-off between exploration and exploitation, it is difficult for individuals to "excel simultaneously at both exploration and exploitation" (Gupta et al., 2006, p. 696), which makes it important to understand "what makes an individual ambidextrous" (Raisch et al., 2009, p. 687). Scholars adopting the contextual perspective of ambidexterity (Gibson & Birkinshaw, 2004; O'Reilly & Tushman, 2004) have examined how contextual factors, such as organisational coordination mechanisms (Mom et al., 2009), performance incentives (Lee & Meyer-Doyle, 2017), human resource practices (Mom et al., 2019) and organisational culture (Lee et al., 2020), influence individual ambidexterity.

Nevertheless, a growing literature focusing on microfoundations of ambidexterity has identified some individual predispositions, such as motivational factors (Jasmand et al., 2012), neuro brain regions (Laureiro-Martínez et al., 2015) and self-efficacy (Kaupplia and Tempelaar, 2016), as determinants of individual ambidexterity. These studies shed some light on how individuals differ in cognitive characteristics that lead to different outcomes of individual ambidexterity (Bidmon & Boe-Lillegraven, 2020). This cognitive perspective of individual ambidexterity posits that individuals use cognitive mechanisms to prioritise their decisions on whether and how they engage in ambidexterity (Gibson & Birkinshaw, 2004; Ossenbrink et al., 2019), and more specifically, whether they pursue exploration and exploitation at a single point of time (Schnellbächer et al., 2019; Tempelaar & Rosenkranz, 2019) or switch between exploration and exploitation (Bidmon & Boe-Lillegraven, 2020). This prior research has focussed on a single cognitive factor and its direct effects on individual ambidexterity. Studies which look at how cognitive resources integrate to enable individual ambidexterity to remain limited (Tempelaar & Rosenkranz, 2019).

Social cognitive theory (SCT) argues that individuals' cognitive and ability traits are influenced by not only micro-level behavioural features but also institutional environments (Wood & Bandura, 1989). Recent research in international business (IB) also suggests that institutional environments are important boundary conditions for organisational ambidexterity (Egelhoff, 2020). Despite this impetus, a comprehensive understanding and a systemic analysis of how institutional environments interact with micro-level cognitive traits to generate expected outcomes of innovation is not available (Boudreaux et al., 2019). Grounded in SCT and drawing on the ambidexterity and the IB literature, we address these issues by developing a conceptual model to examine *how individual ambidexterity is facilitated by individual self-efficacy and resilience across different institutional environments*.

Self-efficacy and resilience are crucial cognitive/psychological attributes that enable individuals to develop their capabilities in an institutional context (Lenihan et al., 2019). Specifically, self-efficacious people engage in goal-achievement activities and repetitively pursue those goals even in the face of failures (Hirst et al., 2018). This tenacity facilitates resilience, which helps individuals to cope with the negative or stressful emotions. Building on these tenets, we propose that self-efficacy facilitates individual ambidexterity via resilience. Moreover, institutions as rule setters of the game are considered as a basis for resource exchange, allocation, and transaction through the imposition of constraints (Wood & Bandura, 1989). We argue that with well-developed institutions, individuals can leverage the external facilitation to enhance individual ambidexterity. We focus on the contingent effects of economic

institutional environment on the micro-level causal path relationship between self-efficacy, resilience, and individual ambidexterity. This investigation is important because economic institutions define economic rules and have rapid changes that can influence individuals' ability to "exploit their socio-cognitive resources" to pursue innovation (Boudreaux et al., 2019, p. 180).

Empirically, following Richter, Sinkovics, et al. (2016) recommendations for international business research, we employ the partial least squares modelling method (PLS-SEM) to examine our conceptual model by using data collected in China, New Zealand and Australia. We further employ finite mixture partial least squares (FIMIX-PLS) analysis (Hair et al., 2016) and fuzzy-set qualitative comparative analysis (fsQCA) (Fiss, 2011) to evaluate unobserved heterogeneity (Gelhard et al., 2016). Importantly, fsQCA allows us to complement the findings from PLS-SEM and shed further light on the distinct configurations of antecedent factors of individual ambidexterity.

This study makes two primary contributions. We firstly contribute to the IB literature with a set of micro-foundation findings in different institutional contexts by addressing the call for micro-foundational research on ambidexterity in IB (Christofi et al., 2021) and cognitive/psychological explanations for ambidexterity (Kauppila & Tempelaar, 2016). Our study advances our understanding of how micro-level self-efficacy promulgates individual resilience that determines individual ambidexterity across macro-level economic institutions. The analysis shows that economic institutions alter the impact of individual resources (i.e., self-efficacy and resilience) on individual ambidexterity. These findings build a nascent link of individual resources and capabilities with institutional environments which sheds new light on the implication of micro-foundations across institutional contexts (Felin et al., 2012).

Second, we employ both PLS-SEM and fsQCA analysis, providing a new option for future ambidexterity and IB studies. Prior research had applied both PLS-SEM and fsQCA respectively to investigate IB research questions (Jean et al., 2018; Lin, 2020) respectively. The simultaneous use of PLS-SEM and fsQCA enables us to have complementary insights into our findings. Specifically, PLS-SEM provides the effects sizes of measures of self-efficacy, resilience, and individual ambidexterity and our conditional mediation (CoMe) analysis in PLS-SEM enables us to precisely explain the differences of the strengths of the relationship between self-efficacy, resilience, and individual ambidexterity in different economic institutions. fsQCA provides an in-depth understanding of the complex and synergistic effects of self-efficacy, resilience, and economic institutions on individual ambidexterity.

2 Theoretical Background and Hypothesis Development

2.1 Individual Ambidexterity and Social Cognitive Factors

While ambidexterity has been discussed in several different ways such as adaptability and alignment (Gibson & Birkinshaw, 2004), flexibility and efficiency (Adler et al., 1999; Yu et al., 2020), and radical and incremental innovation (Smith & Tushman, 2005), the most predominant view conceptualizes

ambidexterity based on "March's (1991) notions of exploration and exploitation" (Simsek et al., 2009, p. 865; Zimmermann et al., 2015). Building on this insight, individual ambidexterity refers to an individual's dynamic ability to simultaneously engage in, and/or switch between, exploration and exploitation (Kauppila & Tempelaar, 2016; Mom et al., 2009; Rogan & Mors, 2014; Tempelaar & Rosenkranz, 2019; Zhang et al., 2022). Exploration and exploitation stem from different underlying knowledge, entail different challenges, and require different learning processes to develop (Lee & Meyer-Doyle, 2017). As a result, individuals' decisions on ambidexterity are not dependent on organisational management (Ossenbrink et al., 2019). Rather, the cognitive perspective of ambidexterity suggest that micro-level ambidexterity is associated with complex cognitive characteristics and processes (Gupta et al., 2006; Tempeleer and Rosenkranz, 2019). This perspective aligns with social cognitive theory, arguing that individuals' behaviour is influenced by the characteristics of a set of personal resources and capabilities in environmental contexts (Wood & Bandura, 1989). Building on this perspective we posit that individual self-efficacy and resilience, as two important types of personal capital (Luthans et al., 2007), influence individual ambidexterity. Self-efficacy represents beliefs in one's abilities and skills to "mobilise the motivation, cognitive resources, or courses of action needed to successfully execute a specific task within a given context" (Stajkovic & Luthans, 1998, p. 66), and resilience refers to an individual's "developable capacity to rebound or bounce back from adversity, conflict, failure, or even positive events, progress, and increased responsibility" (Luthans, 2002, p. 702).

Specifically, the mixed findings of significant (Kauppila & Tempelaar, 2016) and insignificant (see Jansen et al., 2016) effects of self-efficacy on ambidexterity in the literature suggest that the force of self-efficacy per se may be insufficient to fully explain ambidexterity. We therefore contend that resilience serves as an effective mechanism that integrates self-efficacy to facilitate individual ambidexterity. We further posit that institutions are an influential contingency on which individual ambidexterity is developed from the integration of self-efficacy and resilience as institutions are the "rules of the game" that determine "the subjective mental constructs that individuals use to interpret the world around them and make choices" (North, 1990, p. 3). Thus, individual cognitive/psychological (e.g., self-efficacy; resilience) and innovative traits (e.g., ambidexterity) are embedded in a set of institutional conditions, suggesting that the self-efficacy–resilience–ambidexterity relationship is contingent on formal economic institutions, as shown in Fig. 1.
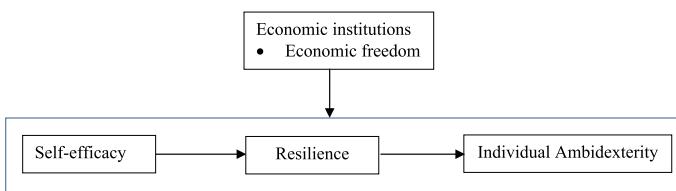
Fig. 1 Conceptual framework

2.2 Self-Efficacy, Resilience, and Individual Ambidexterity

Self-efficacy enables people to engage with complex goals (Kauppila & Tempelaar, 2016) and develop divergent abilities such as individual ambidexterity (Tempelaar & Rosenkranz, 2019). Ambidexterity requires individuals to set flexible cognitive frames about how to allocate their limited resources between exploration and exploitation (Gibson & Birkinshaw, 2004). Self-efficacious individuals typically engage in self-determining tactics that allow them to pivot their cognitive resource allocation between exploration and exploitation (Kauppila & Tempelaar, 2016). Additionally, self-efficacy allows proactive engagement with tasks that demand multiple and conflicting behaviours (Mom et al., 2019), thereby enhancing individual ambidexterity (Avey et al., 2010).

Resilience may mediate the relationship between self-efficacy and individual ambidexterity for multiple reasons. First, self-efficacy forms the belief in one's ability to engage in a variety of tasks and becomes an internalised motivational resource (Avey et al., 2010). This belief and resource lead to an increased tendency to further develop abilities to deal with challenges and setbacks which lie at the core of resilience (Bandura, 1997). Second, resilience reflects the ability to manage changing situations and bounce back from adversity, conflict, and uncertainty (Luthans, 2002; Shin et al., 2012). It represents the capacity to cope with hardship, handle problems generated by conflict or adverse situations, and recognise risk in preparation for risk-taking (Bullough et al., 2014; Chadwick & Raver, 2020; Shin et al., 2012). Such characteristics of resilience are noteworthy for individual ambidexterity as it is also accompanied by high risk (Lee & Meyer-Doyle, 2017; March, 1991) and "setbacks and failures" (Kauppila & Tempelaar, 2016, p. 1025). In this sense, resilience generated by self-efficacy may increase the degree of individual ambidexterity by helping individuals to transform positive thinking, make optimistic decisions and feel more competent when dealing with changes and risks. Moreover, self-efficacious individuals are more likely to formulate strategies irrespective of resource constraints (Chadwick & Raver, 2020) and "have a pathway to resilience in which they frame a negative event or failure as a learning experience" (Luthans et al., 2006, p. 31) in turn enhancing individual ambidexterity.

Further, resilience is developed by learning over time and is characterised by deep-seated beliefs (Bullough et al., 2014). Self-efficacious individuals with strong beliefs tend to make more concerted efforts to learn their challenging and risky tasks (Bandura & Locke, 2003), with this leading to an increased likelihood of creating effective pathways towards resilience (Luthans et al., 2006). Such resilience aids individuals to incorporate resources from the organisational and environmental contexts into internalised motivations (Avey et al., 2010). In this sense, constrained resources for individual ambidexterity are solved.

> Hypothesis 1: *Resilience mediates the relationship of self-efficacy and individual ambidexterity; such that self-efficacy facilitates individual ambidexterity through increasing resilience.*

2.3 The Moderating Effects of Economic Institutions

Institutional environments directly influence an individual's ability to exploit resources (e.g., employees' socio-cognitive resources) (Boudreaux et al., 2019) by regulating resource allocation, providing market opportunities, and determining social benefits (Cuervo-Cazurra et al., 2019). Among institutions, economic freedom is associated with the degree of an "absence of government coercion or constraints on the production, distribution, or consumption of goods and services beyond the extent necessary for citizens to protect and maintain liberty itself" (Beach & O'Driscoll, 2003, p. 2; Grøgaard et al., 2019). The self-efficacy–resilience–individual ambidexterity relationship may become stronger when the degree of economic freedom is low for two reasons.

First, in an institutional environment with low economic freedom there are more regulatory and capital interventions in business activities (Gwartney et al., 2020) which increase the uncertainty of the business environment (Heckelman, 2000) and limit resource mobility (Peng & Heath, 1996). Both factors make it difficult for individuals to predict the expected return from their innovative activities, thereby reducing the effectiveness of their innovation (North, 1990). Under this context, individual ambidexterity is likely to take on a more radical form and to be more opportunity-motivated (Mom et al., 2019) and the efficiency of resource allocation becomes important (Raza et al., 2020).

Second, a low level of economic freedom corresponds with more government intervention (Heckelman, 2000), thereby leading to more restrictions on resources. Such restrictions make opportunity identification for innovation more challenging and hinder individual's ability to "capitalise on their psychological resources" (Boudreaux et al., 2019, p. 183). Further, in an environment with low economic freedom people are usually rewarded for obeying pre-set guidelines instead of innovation (Makhija & Stewart, 2002). Such obedience limits "the returns to skills to managing risk or adapting resources to changing market forces" (Boudreaux et al., 2019, p. 183). Thus, when faced with stressful and difficult circumstances promulgated by the low degree of economic freedom, resilience (i.e., the ability to deal with conflicting events) plays a more important role as an enabling mechanism through which individuals utilise their self-efficacious resources to pursue ambidexterity.

> Hypothesis 2: *Economic freedom moderates the effect of self-efficacy on individual ambidexterity through resilience, such that this efficacy–resilience–ambidexterity relationship is stronger when economic freedom is low.*

3 Methods

3.1 Sample and Data Collection

We collected survey data from knowledge workers in China, New Zealand, and Australia. These countries were chosen to capture differences between macro-economic

institutions that may alter the relationships among self-efficacy, resilience, and individual ambidexterity (e.g., Boudreaux et al., 2019; Hirst et al., 2018). Also, we focused on knowledge workers because they engage in difficult problem-solving activities (Brennecke, 2020, p. 753) more than others.

We identified knowledge workers with two criteria: (1) whether a participant is working in knowledge-intensive organisations/workplace (Brennecke, 2020), including R&D companies, high-tech firms, and professional service companies (e.g., IT development and services, finance, consultancy, law and legal services, market research, advertising agencies (Lee & Miozzo, 2019) and (2) whether their job comprises knowledge work (e.g., "planning, analysing, interpreting, developing, and creating products and services using information, data, or ideas as the raw materials") (Reyt & Wiesenfeld, 2015, p. 752).

We approached knowledge workers in China in two ways: (1) directly recruiting through an online survey platform and (2) indirectly recruiting in organisations where DBA and EMBA alumni of two top universities work (Daniel et al., 2018). Among the 1448 knowledge workers from more than 11 provinces, 1396 were retained after list-wise deletion of cases with missing data. We collected data in New Zealand and Australia via a globally recognised data collection agency, Dynata, which offers an expedient and cost-effective mode for sourcing survey data. Dynata administered the survey employing parameters like those used for the Chinese sample; a total of 511 usable responses were obtained.

The questionnaire was developed according to validated items in the literature. A translation-back-translation procedure was used. We also invited three Chinese academics to read the Chinese version of the questionnaire and provide feedback. The questionnaire was then pilot tested with 20 knowledge workers to confirm readability and clarity.

3.2 Measures

For key constructs, each item was measured on a 7-point Likert scale ranging from 1 = "strongly disagree" to 7 = "strongly agree," as elaborated below.

Individual ambidexterity: We measured individual ambidexterity as a second-order construct of exploration and exploitation. This approach provides a way to explicitly reflect the conceptual idea of both combination and simultaneity of exploration and exploitation (Wang et al., 2019). In detail, we measured the first-order exploration and exploitation using items developed by Mom et al. (2007). Exploration was measured with five items pertaining to the extent to which individual knowledge workers have pursued exploratory activities ($\alpha = 0.900$), after eliminating two items given their poor factor loadings (< 0.40). Similarly, five out of seven items from Mom et al. (2007) were adopted for exploitation such as "Activities of which it is routine" ($\alpha = 0.910$). Two items were removed, because one had a low factor loading and the other showed a high outer Variance Inflation Factor (VIF) value (VIF > 5) (Hair et al., 2017). Second, we measured individual ambidexterity as a latent variable with exploration and exploitation as its two indicators (Mom et al., 2019) (see Appendix 1).

Self-efficacy: We adopted three items of the 12-item Psychological Capital Questionnaire (PCQ-12) to measure self-efficacy ($\alpha = 0.903$). The PCQ-12 was originally developed by Luthans et al. (2007) and validated in subsequent studies (e.g., Baron et al., 2016).

Resilience. Similarly, we measured this construct using the three resilience items from the PCQ-12 ($\alpha = 0.867$). Compared with other measures of resilience, the PCQ measure "captures resilience as a relatively stable individual difference" (Chadwick & Raver, 2020; p. 241).

Economic freedom: We measured high economic freedom (New Zealand: 8.53; Australia: 8.23) and low economic freedom (China: 6.21) according to the country level scores of the Economic Freedom of the World Index in 2020 (Gwartney et al., 2020).

Control variables: Consistent with previous studies of individual ambidexterity (Kauppila & Tempelaar, 2016; Tempelaar & Rosenkranz, 2019), we first controlled for *age* measured with five groups (1 = "18–29 years"; 2 = "30–39 years"; 3 = "40–49 years"; 4 = "50–59 years"; and 5 = "60 or above 60 years"). Second, we included a dummy control variable for *gender* (1 = "Male" and 0 = "Female"). Finally, we controlled for *tenure*, which was measured by the individual's number of years with the firm, with these categorised into four groups (1 = "less than 1 year"; 2 = "between 1–5 years"; 3 = "between 5–10 years"; 4 = "more than 10 years").

3.3 Analytical Models

We applied PLS-SEM for data analysis which fits well with the focus of this research on theoretical exploration (Richter, Cepeda, et al., 2016, 2016b). Following Cheah et al.'s (2021) recommendation on the conditional moderated mediation (CoMe) analysis, we also used the PLS-MGA approach for analysing the moderating effects of economic freedom. We further used the fuzzy set qualitative comparative analysis (fsQCA) (Fiss, 2011; Ragin, 2008) to explore supplementary insights into how self-efficacy and resilience along with other factors combine in different ways to affect individual ambidexterity.

4 Results

4.1 Measurement Model

We assessed the reliability and validity of our measurement model in several ways. First, using a bootstrapping procedure with a subsample of 5000, we assessed the indicator loadings and their significance. All the first-order standard factor loadings [minimum factor loading: $min(L) = 0.818$] have significant values ($p < 0.001$) greater than the recommended cut-off value of 0.708 (Hair et al., 2020) and their corresponding loaded weights are also significant ($p < 0.001$), suggesting indicator reliability (see Appendix 1). Next, consistency reliability was measured with Cronbach's alphas (α) and composite reliability (*CR*). The results in Table 1 and Appendix 1

Table 1 Convergent Validity

Constructs	CR	AVE	Fornell–Larcker criterion					
			1	2	3	4	5	6
1 Ambidexterity	0.943	0.626	0.791					
2 Self-efficacy	0.940	0.838	0.614	0.916				
3 Resilience	0.918	0.790	0.589	0.774	0.889			
4 Gender	1	1	0.072	0.060	0.014	1		
5 Age	1	1	− 0.012	0.036	0.074	− 0.094	1	
6 Tenure	1	1	− 0.063	− 0.044	− 0.018	− 0.056	0.578	1

show that the minimum value of alphas ($min(\alpha) = 0.867$) and CRs ($min(CR) = 0.918$) for all constructs exceeds the threshold value of 0.70, indicating consistency reliability. The values of $max(\alpha) = 0.910$ and $max(CR) = 0.943$ are also smaller than 0.95, confirming the required diversity of multi-item constructs (Hair et al., 2020).

We measured convergent validity by the average variance extracted (AVE). The results in Table 1 demonstrate that AVE scores ($min(AVE) = 0.626$) are greater than the cut-off level of 0.5 in all cases, showing convergent validity. Finally, discriminant validity was assessed by the Fornell–Larcker criterion and the heterotrait–monotrait (HTMT). As shown in Table 1, the square root values of AVE are greater than the corresponding correlations between the constructs fulfilling Fornell–Larcker's criterion while, as indicated in Table 2, all HTMT scores are less than the threshold of 0.90 (Hair et al., 2020). These results together confirm that all constructs have a sufficient level of discriminant validity.

4.2 Common Method Bias

We used both procedural and statistical approaches to check for potential common method bias (CMB). First, following Podsakoff et al. (2003), we developed measures of key constructs using validated items from the literature and conducted a pre-test in our questionnaire design as discussed previously. Second, we applied the unmeasured methods latent factor approach to "control for (or partial out) method effects" (Podsakoff et al., 2003, p. 889) and included a common method factor in

Table 2 The heterotrait–monotrait ratios of constructs

	1	2	3	4	5	6
1 Ambidexterity						
2 Self-efficacy	0.666					
3 Resilience	0.652	0.874				
4 Gender	0.075	0.064	0.027			
5 Age	0.105	0.038	0.08	0.094		
6 Tenure	0.095	0.047	0.022	0.056	0.578	

the PLS measurement model (see Liang et al., 2007) in which each indicator's variance was explained by both its principal construct (substantive variance) and by the common method factor (method variance). As shown in Table 3, 10 out of 16 of the method factor loadings are insignificant ($p > 0.05$) and the average substantive variance is 0.665, while the average method variance is 0.011, leading to a ratio of 60.5:1. Together, these results show that common method bias is not a concern.

4.3 Structural Model

Prior to hypothesis testing we assessed the predictive validity of the structural model by using the coefficient of determination in endogenous constructs (R^2). The Stone–Geisser (Q^2) generated from the blindfolding procedure indicated an omission distance of 7 (Hair et al., 2017), suggesting the confirmation of relevance. As demonstrated in Table 4, *adjusted R^2* values of individual ambidexterity ($R^2_{adj} = 0.412$) and resilience ($R^2_{adj} = 0.602$) confirm that the model has strong in-sample predictive power (Hair et al., 2017). Moreover, the Q^2 values of individual ambidexterity ($Q^2 = 0.266$) and resilience ($Q^2 = 0.485$) confirm the predictive relevance ($Q^2 > 0$) of the structural model. We also checked VIFs of constructs to determine if there is a threat of high multicollinearity. The results show that the maximum VIF value is 2.518, smaller than the cut-off value of 3 (Hair et al., 2020), suggesting that multicollinearity is unlikely a concern in this model.

Table 3 Common method bias analysis

Construct	Indicator	SFL (L_1)	$(L_1)^2$	MFL (L_2)	$(L_2)^2$
Exploration	Explore1	0.776***	0.602	− 0.045	0.002
	Explore2	0.946***	0.895	− 0.190***	0.036
	Explore3	0.672***	0.452	0.068	0.005
	Explore4	0.475***	0.226	0.109	0.012
	Explore5	0.946***	0.895	− 0.175***	0.031
Exploitation	Exploit1	0.646***	0.417	0.187*	0.035
	Exploit2	0.944***	0.891	− 0.113*	0.013
	Exploit3	0.842***	0.709	− 0.104	0.011
	Exploit4	0.764***	0.584	0.034	0.001
	Exploit5	0.815***	0.664	− 0.008	0.000
Self-efficacy (SelfEff)	SelfEff1	0.936***	0.876	− 0.044	0.002
	SelfEff2	0.841***	0.707	0.058	0.003
	SelfEff3	0.871***	0.759	− 0.014	0.000
Resilience (Resl)	Resl1	0.773***	0.598	0.092*	0.008
	Resl2	0.823***	0.677	− 0.132**	0.017
	Resl3	0.826***	0.682	0.016	0.000
Average			0.665		0.011

SFL substantive factor loading, *MFL* method factor loading

Significant level: ***p < 0.001, **p < 0.01, *p < 0.05, †p < 0.10

Table 4 Results of PLS-SEM estimation

Endogenous constructs	Adjusted R^2		Stone–Geisser Q^2		
Ambidexterity	0.412*** [0.365, 0.462][a]		0.266		
Resilience	0.602*** [0.559, 0.644][a]		0.485		
Path	Coefficients	SD	95% CI		f^2
			LCI	UCI	
Self-efficacy → resilience	0.774***	0.014	0.747	0.800	1.557
Econfreedom → resilience	− 0.010	0.018	− 0.046	0.027	0.001
Selfeffecacy × econfreedom → resilience	− 0.131***	0.018	− 0.166	− 0.093	0.045
Gender → resilience	0.061**	0.020	0.020	0.100	0.005
Age → resilience	− 0.024	0.015	− 0.052	0.005	0.001
Tenure → resilience	− 0.011	0.018	− 0.046	0.024	0.001
Resilience → ambidexterity	0.256***	0.033	0.192	0.323	0.044
Self-efficacy → ambidexterity	0.415***	0.032	0.351	0.475	0.117
Econfreedom → ambidexterity	0.082***	0.020	0.043	0.121	0.008
Selfeffecacy × econfreedom → ambidexterity	− 0.111***	0.022	− 0.155	− 0.068	0.021
Gender → ambidexterity	− 0.067**	0.023	− 0.113	− 0.023	0.004
Age → ambidexterity	0.053**	0.018	0.018	0.086	0.005
Tenure → ambidexterity	− 0.020	0.022	− 0.063	0.023	0.001
Indirect effects					
Self-efficacy → resilience → ambidexterity	0.198***	0.026	0.148	0.251	

SD standard deviation, *CI* confidence interval, *LCI* lower limit of confident interval, *UCI* upper limit of confidence interval

Significant level: ***p < 0.001, **p < 0.01, *p < 0.05, †p < 0.10

[a]95% confidence interval

We applied *PLSpredict* based analysis (Shmueli et al., 2019) to assess the model's predictive power. The root mean squared error (RMES) are calculated to assess the predictive performance of the model for the constructs and the indicators (Shmueli et al., 2019). The *PLSpredict* results in Table 5 show that all indictors have a value of Q^2 greater than 0 ($Q^2_{predict} > 0$). Moreover, the results show the majority of indicators (9 out of 13) in the PLS-SEM have smaller predication errors than those in the linear regression model (LM), suggesting that the model has a medium predictive power (Shmueli et al., 2019).

4.4 Hypothesis Testing

Hypothesis 1 proposes the mediating effects of resilience on the relationship of self-efficacy with individual ambidexterity. The results in Table 4 show that self-efficacy is positively associated with resilience ($\beta = 0.774$, p < 0.001, with an effect size

Table 5 PLS predict assessment

	PLS		LM	PLS-LM
	RMSE	Q^2	RMSE	RMSE
Exploration1	1.750	0.070	1.717	0.033
Exploration2	1.658	0.071	1.640	0.018
Exploration3	1.412	0.087	1.414	− 0.002
Exploration4	1.343	0.079	1.350	− 0.007
Exploration5	1.590	0.038	1.581	0.009
Exploitation1	1.353	0.120	1.361	− 0.008
Exploitation2	1.261	0.101	1.263	− 0.002
Exploitation3	1.448	0.047	1.449	− 0.001
Exploitation4	1.262	0.118	1.264	− 0.002
Exploitation5	1.195	0.158	1.202	− 0.007
Resilience1	0.970	0.373	0.972	− 0.002
Resilience2	1.250	0.144	1.240	0.010
Resilience3	1.083	0.270	1.085	− 0.002

LM linear regression model, *RMSE* the root mean squared error

of $f^2 = 1.557$), and the effects of resilience on individual ambidexterity ($\beta = 0.256$, $p < 0.001$; $f^2 = 0.044$) are significant, leading to a positive and significant indirect effect of self-efficacy on individual ambidexterity through resilience (*indirect effect* = 0.198 $p < 0.001$). Given that the direct effects of self-efficacy on individual ambidexterity ($\beta = 0.415$, $p < 0.001$; $f^2 = 0.117$) are still significant when resilience is included, resilience is a partial mediator in the relationship of self-efficacy with individual ambidexterity.

Hypothesis 2 posits the moderating effects of economic freedom on the self-efficacy–resilience–individual ambidexterity relationship. We applied PLS-MGA to two subsamples characterised by high and low degrees of economic freedom. Prior to PLS-MGA, we undertook MICOM (Henseler et al., 2016) to check whether measurement variance between groups is established. We compared the original score correlations c against the empirical distribution of the score correlations generated through the permutation process (C_μ) to check if c exceeds the 5% quantile of C_μ to confirm compositional invariance (Schlägel & Sarstedt, 2016). Table 6 shows that the partial measurement invariance for all variables except one (resilience) between our groups of high and low economic freedom was confirmed. The exception of one variable will not have a large influence on the validity of PLS-MGA (Nowiński et al., 2020). We further examined the evenness between composite variance to identify the patterns between variances. Results of the 5000-permutation test (see Table 6) confirm the existence of evenness patterns. Together, these results allow us to further pursue MGA.

Results in Table 7 demonstrate that the difference in the relationship of self-efficacy–resilience–individual ambidexterity between high and low economic freedoms is significant (0.098, $p = 0.072$). Moreover, the differences of the self-efficacy-resilience path between high and low freedom groups are strongly significant

Table 6 MICOM: compositional invariance and equal variances

	High vs low economic freedom					
	c	5% quantile of c_μ	Composi-tional invari-ance	Difference of the compsités variance ratio	95% CL	Equal variance?
Ambidexterity	1.000	1.000	Yes	0.003	[− 0.187; 0.191]	Yes
Exploration	1.000	1.000	Yes	0.002	[− 0.170; 0.174]	Yes
Exploitation	1.000	1.000	Yes	0.003	[− 0.189; 0.189]	Yes
Self-efficacy	1.000	1.000	Yes	0.002	[− 0.191; 0.203]	Yes
Resilience	0.997	1.000	–	0.004	[− 0.207; 0.217]	Yes

95% CL 95% confidence interval

Table 7 Results of multi-group analysis for economics institutions

Path	G1: EF_{low} (n = 879)	G2: EF_{high} (n = 511)	G1–G2
Self-efficacy → resilience	0.810*** (0.018)	0.643*** (0.030)	0.167***
Gender → resilience	− 0.028 (0.020)	− 0.049 (0.034)	0.022
Age → resilience	0.013 (0.022)	0.125** (0.040)	− 0.112*
Tenure → resilience	− 0.026 (0.023)	− 0.003 (0.039)	− 0.022
Resilience → ambidexterity	0.337*** (0.050)	0.272*** (0.056)	0.064
Self-efficacy → ambidexterity	0.366*** (0.047)	0.260*** (0.054)	0.107
Gender → ambidexterity	0.100*** (0.025)	− 0.018 (0.040)	0.119*
Age → ambidexterity	0.001 (0.026)	− 0.088* (0.043)	0.089
Tenure → ambidexterity	0.028 (0.028)	0.019 (0.045)	0.009
Indirect effects			
Selfefficacy → resilience → ambidexterity	0.273*** (0.040)	0.175*** (0.037)	0.098†
Bootstrapped R^2			
Ambidexterity	0.463***	0.227***	
Resilience	0.654***	0.438***	
Measurement model assessment			
Reliability: CR and α	+	+	
Convergent validity: AVE	+	+	
Fornell–Larcker criterion	+	+	
HTMT	+	+	

EF economic freedom, *SelfEff* self-efficacy, *Explore* exploration, *Exploit* exploitation

Significant level: ***p < 0.001, **p < 0.01, *p < 0.05, †p < 0.10

$(GD_{(G1-G2)} = 0.167, \; p < 0.001)$ while the differences of the resilience-individual ambidexterity path between high and low freedom groups are insignificant $(GD_{(G1-G2)} = 0.064, \; p = 0.383)$, showing a first-stage conditional mediation model. Taken together, Hypothesis 2 is supported.

4.5 Assessing Unobserved Endogeneity and Heterogeneity

We adopted Heckman and Robb's (1985) two-stage control function approach (2SCF) to take account of individual ambidexterity's error term that might be correlated with resilience when estimating the effect of resilience on individual ambidexterity. In the first stage, we employed the *diversity climate of the workplace* as an instrumental variable to estimate resilience. It asks how knowledge workers perceive their workplace as comprising a work environment in which they are treated fairly (Newman et al., 2018) and is measured with a 5-point scale ranging from 1 = strongly disagree to 5 = strongly agree. The results show that *diversity climate of workplace* is significantly associated with resilience ($\beta = 0.051$, $p = 0.044$). In the second stage, we included the error term (*r_c1*) obtained from the first stage as an additional regressor and as such, individual ambidexterity is estimated as a function of self-efficacy, resilience, *r_c1*, along with control variables. The results demonstrate that self-efficacy ($\beta = 0.399$, $s.e = 0.027$, $p < 0.001$) and resilience ($\beta = 1.040$, $s.e. = 0.402$, $p = 0.008$) are significantly associated with individual ambidexterity while the effects of *r_c1* on individual ambidexterity are significant at the 95% significance level ($\beta = -0.752$, $s.e. = 0.459$, $p = 0.051$).

We ran the finite mixture partial least squares (FIMIX-PLS) procedure on the data (Hair et al., 2016) to identify unobserved heterogeneity. Following prior research (e.g., Gelhard et al., 2016), we ran the FIMIX-PLS algorithm by using the stop criterion of $10^{-10} = 1.0E-10$, the maximum number of iterations of 5000 and the number of repetitions of 10 for each of segments (g = 1–6). To determine the appropriate number of segments, we used the Akaike information criterion (AIC), modified AIC_3, Bayesian information criterion (BIC), heuristic consistent AIC (CAIC) and normed entropy statistics (EN) (Gelhard et al., 2016). The results in Table 8 suggest that either the six-segment or the three-segment solution are the most adequate and

Table 8 FIMIX-PLS

S	AIC	AIC3	BIC	CAIC	EN	Relative segment size					
						g = 1	g = 2	g = 3	g = 4	g = 5	g = 6
2	8403.06	8442.06	8619.64	8658.64	0.76	0.51	0.49				
3	6528.88	6587.88	6856.52	6915.52	0.81	0.49	0.38	0.13			
4	6037.16	6116.16	6475.87	6554.87	0.77	0.39	0.31	0.18	0.13		
5	5477.48	5576.48	6027.26	6126.26	0.77	0.26	0.23	0.22	0.16	0.13	
6	4885.65	5004.65	5546.49	5665.49	0.79	0.34	0.28	0.19	0.09	0.07	0.03

S segments, *AIC* Akaike information criterion, *AIC₃* modified AIC, *BIC* Bayesian information criterion, *CAIC* heuristic consistent AIC, *EN* normed entropy statistics

the three-segment solution also meets more the minimum sample size requirement for each segment. These results together show the existence of heterogeneity suggesting that fsQCA should be conducted to explain this unobserved heterogeneity (Gelhard et al., 2016).

4.6 Supplementary Analysis: fsQCA

The results from PLS-SEM and PLS-MGA suggest that the explanation of individual ambidexterity does not rely on a single factor, rather it is contingent on the integrative relationships between self-efficacy, resilience, and economic institutions along with other variables. We then used fsQCA to further identify necessary and/or sufficient conditions (e.g., self-efficacy, resilience, economic institutions, etc.) that generate an outcome (e.g., individual ambidexterity) (Ragin, 2008).

To proceed fsQCA, we calibrated fuzzy-set memberships according to three qualitative thresholds: fully-in, the crossover point, and fully-out membership. Following prior research (Linder et al., 2020; Renko et al., 2020), we used the 75th percentile, the median and the 25th percentile as thresholds for fully-in, the crossover and fully-out membership respectively. The selection of these thresholds and the use of the same rule allowed us to reduce the degree of researcher freedom (Douglas et al., 2020). To deal with the methodological difficulties associated with a membership score of exactly 0.50, we added a 0.001 constant to all such calibrated scores (Fiss, 2011). We operationalised individual ambidexterity as a multiplication of individual exploration and exploitation (Mom et al., 2009; Tempelaar & Rosenkranz, 2019) to make this variable available to be calibrated. Table 9 summarises the values used for each variable's calibration. We then conducted necessity analyses to examine if any condition was necessary by itself to achieve individual ambidexterity. A condition is considered necessary if it has a consistency value greater than 0.90 (Greckhamer et al., 2018). Results demonstrate that no single condition is necessary for individual ambidexterity to occur ($max(consistency)=0.776$; $max(coverage)=0.735$).

Finally, given that the principle of mediation and moderation effects is to demonstrate the integrative and/or interactive effects of the independent and the mediating variables on the dependent variable, we ran configurational analyses by drawing on the consolidated truth-table (Kaya et al., 2020) in which there are 2^k logically possible

Table 9 Descriptives and calibrations

Theoretical attributes	Mean	s.d	Fully in	Crossover	Fully out
Ambidexterity	24.20	11.24	31.67	22.67	16.00
Resilience	5.29	1.16	6.00	5.33	4.67
Self-efficacy	5.21	1.23	6.00	5.33	4.33
Gender	0.61	0.49	–	–	–
Age	2.46	0.85	3.00	2.00	2.00
Tenure	2.21	1.02	3.00	2.00	1.00
Economic freedom	0.27	0.44	–	–	–

A constant of 0.001 was added to the causal conditions below full member scores of 1. (75 percentile)

configurations (k=the number of conditions) (Ragin, 2008). We obtained a truth-table with $2^k=64$ ($k=6$) logical combinations of causal conditions. We further consolidated our truth-table by choosing a raw consistency threshold of 0.80 (Renko et al., 2020) and a frequency cut-off of 5 cases in each configuration (Linder et al., 2020). We also ensured that the overall solution consistency was above the threshold of 0.80 (Fiss, 2011).

Table 10 reports a combination of parsimonious and intermediate solutions (Douglas et al., 2020; Renko et al., 2020). In detail, the results for the presence of individual ambidexterity show three configurations. All the configurations have high consistency (> 0.80), indicating the solution's reliability. The overall solution consistency (scon) of 0.804 and the overall solution coverage (scov) of 0.472 for the three configurations show sufficient consistency (con), raw coverage (rcov) and unique coverage (ucov), suggesting informative solutions for individual ambidexterity. More importantly, three configurations for individual ambidexterity differ in their core conditions, revealing first-order equifinality (Fiss, 2011) and confirming our conceptual assumption that there are complex and multiple paths leading to the pursuit of individual ambidexterity.

Specifically, Configuration 1 (cons=0.801; rcov=0.367; ucov=0.189) applies to *young knowledge workers*. They pursue individual ambidexterity by focusing on their cognitive resources. While both self-efficacy and resilience are sufficient, self-efficacy is a core condition for these knowledge workers to pursue individual ambidexterity. Configuration 2 (cons=0.853; rcov=0.255; ucov=0.077) involves *male knowledge workers in an environment with low economic freedom*. These knowledge workers, especially elder ones, rely on both self-efficacy and resilience as core conditions to pursue their individual ambidexterity, providing supplementary support for the partial mediating effects of resilience on the relationship between self-efficacy and individual ambidexterity. Configuration 3 (cons=0.820; rcov=0.028;

Table 10 Solutions for individual ambidexterity

	High individual ambidexterity		
	1	2	3
Resilience	●	●	●
Self-efficacy	●	●	●
Age	⊗	●	●
Gender		●	
Tenure	⊗		⊗
Economic freedom	⊗	⊗	●
Consistency	0.801	0.853	0.820
Raw coverage	0.367	0.255	0.028
Unique coverage	0.189	0.077	0.027
Overall consistency	0.804		
Overall coverage	0.472		

Black circles (●) indicate the presence of a condition, and circles with a cross-cut (⊗) indicate the absence of a condition. Blank spaces indicate the condition may not be either present or absent. Consistency cutoff: 0.816, frequency cut: 5

ucov = 0.027) includes *non-tenured knowledge workers* in an environment with high economic freedom. When pursuing individual ambidexterity, these non-tenured knowledge workers emphasise the importance of both self-efficacy and resilience but take self-efficacy as a core condition. The emphasis on economic freedom as a core condition in Configurations 2 and 3 offers some support for the moderating effects of economic institutions.

To further validate the effects of self-efficacy and resilience on individual ambidexterity was validated by using different thresholds of calibration. Specifically, self-efficacy and resilience are measured as a multi-item construct in which each item was measured on a seven-point Likert-scale. Following prior research, (Haefner et al., 2021), we use the thresholds at 7, 5 and 3 as the thresholds of fully-in, crossover and fully-out membership. For other conditions, we used the 95th, 50th and 5th percentile as the thresholds (Kimmitt et al., 2020). Results demonstrate there are three configurations for the presence of individual ambidexterity (scon = 0.809, scov = 0.782) including (1) resilience·self-efficacy·~tenure·~economics freedom (cons = 0.851; rcov = 0.482; ucov = 0.155), (2) resilience·self-efficacy·gender·~economics freedom (cons = 0.817; rcov = 0.431; ucov = 0.105), and (3) resilience·self-efficacy·age·economics freedom (cons = 0.790; rcov = 0.196; ucov = 0.196). In general, results from fsQCA reinforced findings of PLS analyses and did not significantly change our key study findings discussed previously.

5 Discussion and Conclusion

5.1 Theoretical Implications

This study contributes to the growing literature of microfoundations of ambidexterity (Mom et al., 2019; Tempelaar & Rosenkranz, 2019) by responding to calls for cognitive/psychological explanations of ambidexterity (Jansen et al., 2016; Kauppila & Tempelaar, 2016). Our research not only provides new and robust evidence for how knowledge workers use their cognitive resources (e.g., self-efficacy) to underpin individual ambidexterity, but it also illuminates that resilience as a psychological ability is a new facilitator of ambidexterity. Our findings are consistent with this coping strategy argument which emphasises the importance of developing reactive abilities (e.g., resilience) to deal with conflicting tasks in stressful circumstances (Shin et al., 2012). More importantly, our research adds to the literature of mechanisms for the relationship between self-efficacy and ambidexterity (Kauppila & Tempelaar, 2016). Specifically, our findings suggest that while self-efficacy is a valuable cognitive resource, its mediating mechanism with resilience is even more effective for enhancing ambidexterity. It also presents a doable solution for the dark-side effects of self-efficacy on ambidexterity previously highlighted in some studies (e.g., Jansen et al., 2016).

In response to recent calls for more interaction between macro institutions and micro individual-based factors in innovation and entrepreneurial behaviour (Boudreaux et al., 2019), we explicitly examined how macro-level economic institutions affect how knowledge worker's self-efficacy facilitates resilience, with this in turn, procuring benefits for individual ambidexterity. Though the impact of

institutions on individuals has been well documented, prior empirical studies have focused on firm-level outcomes. Our findings enrich our understanding by providing robust evidence of the contingency of the indirect effects of self-efficacy on individual ambidexterity through resilience on different types of economic institutions in terms of economic freedom. Specifically, prior research shows that when the economic institution is weak, self-efficacy may not be a sufficient condition for individual entrepreneurial and innovation behaviour (Boudreaux et al., 2019). Our findings present a possible solution for knowledge workers who are in weak economic contexts, to possibly use their resilience as a personal ability to capitalise their self-efficacy beliefs to benefit individual ambidexterity.

Further, our study responds to calls for developing our understanding of the microfoundations in IB (Foss & Pedersen, 2019). Current studies in IB have focussed on organisational level factors and decisions. Individuals are, however, a critical asset for competitive advantage, so it is important to understand the micro-level antecedents of ambidexterity. With firms going global, organisational units such as foreign subsidiaries could locate in different geographical contexts, and this means it is important to improve our understanding about how individual employees develop their ambidexterity in different institutional environments (Christofi et al., 2021). Our findings help identify and clarify the institutional conditions under which knowledge workers might optimally benefit when integrating their psychological assets for individual ambidexterity. By adding to our knowledge of the institution-based view at the individual level, this study hopefully directs future research endeavours towards examining how psychological explanations of individual ambidexterity are contingent on institutional contexts.

5.2 Managerial Implications

Our findings have implications for managerial practices. First, our results regarding self-efficacy suggest that organisations wishing to promote individual ambidexterity should consider developing suites of policies that support and promote development of an organisational culture that fosters skilled employees to develop their ambidextrous abilities and enhance their confidence and self-motivation in conducting innovative and challenging activities in their work. Second, the mediating effects of resilience recommend that organisations should consider how their policies and practices might best support resilient employees. Managers should ensure workers have opportunities to develop resilience and self-efficacy as well as opportunities to integrate these attributes. Managerial interventions addressing integration might focus on developing individual's self-efficacious confidence and beliefs on long-term goals of innovative behaviour and, in turn, increase their positive attitude towards problems and adversity. Finally, our study confirms that the integration of individual self-efficacy and resilience helps employees to pursue individual ambidexterity in low economic-freedom environments. This finding suggests that IB managers operating in environments with low economic freedom need to become cognisant about how individuals are influenced by and respond to institutions and exploit institutional factors to enhance self-efficacy and resilience when promoting ambidexterity.

5.3 Limitations and Future Research

We note our research has limitations that suggest pathways for future research. First, we focussed on cognitive explanations of self-efficacy and resilience for individual ambidexterity. However, individual ambidexterity is self-reinforcing and can be developed through various traits. Future research would benefit from differentiating the effects of other types of traits such as intellectual capital (Kang & Snell, 2009) to provide broader insights and identify theoretical and practical implications regarding the integration of the micro-foundational underpinnings of ambidexterity. Moreover, we used economic freedom as a specific dimension of institutions to identify a meaningful contingent effect. Given the multifaceted nature of institutions, future research may test additional institutional factors to illuminate which facet is the most salient "psychological dimension" (Harper, 2003, p. 74). Further, future research would benefit from using a longitudinal design to understand how individual self-efficacy and resilience are developed "over time with various implications" (Chadwick & Raver, 2020, p.247) to affect ambidexterity.

In conclusion, our study highlighted that resilience, as an ability-based mechanism, is particularly important for knowledge workers to capitalise on their self-efficacy to pursue individual ambidexterity. Of particular salience to the IB literature, our study demonstrates that the micro-level relationship between self-efficacy, resilience, and individual ambidexterity is contingent on macro-level institutions. These novel insights point to the complex and differential cognitive explanations of ambidexterity that can be generated through study across both micro- and macro-levels.

Appendix 1: Measurement variables

	Factor loading	Weights
Exploration (α=0.900, CR=0.926, AVE=0.714) (Mom et al., 2007, 2009) To what extent that you are capable of engaging in work related activities that can be characterised as follows:		
Searching for new possibilities with respect to products/services, processes or markets	0.841***	0.235***
Focusing on strong renewal of products/services or processes	0.853***	0.231***
Activities requiring you to learn new skills or knowledge	0.882***	0.254***
Activities which have not been specifically stipulated in existing company policy	0.828***	0.239***
Activities that are not (yet) clearly existing company policy	0.818***	0.224***
Exploitation (α=0.910, CR=0.933, AVE=0.735) (Mom et al., 2007, 2009) To what extent that you are capable of engaging in work related activities that can be characterised as follows:		
Activities of which a lot of experience has been accumulated by yourself	0.845***	0.239***
Activities of which it is a routine	0.847***	0.222***
Activities which serve existing (internal) customers with existing services/products	0.862***	0.236***

	Factor loading	Weights
Activities primarily focused on achieving short-term goals	0.863***	0.234***
Activities which clearly fit into existing company policy	0.868***	0.236***
Self-efficacy (α=0.903) (Luthans, et al., 2007)		
I feel confident in representing my work area in meetings with management	0.922***	0.364***
I feel confident contributing to discussions about the company's strategy	0.922***	0.366***
I feel confident presenting information to a group of colleagues	0.902***	0.362***
Resilience (α=0.867) (Luthans, et al., 2007)		
At this time, I am meeting the work goals that I have set for myself	0.896***	0.390***
I can be "on my own," so to speak, at work if I have to	0.874***	0.359***
I usually take stressful things at work in stride	0.896***	0.376***

Significant level: ***$p<0.001$, **$p<0.01$, *$p<0.05$, †$p<0.10$.

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