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Enabling SMEs' Learning from Global Value Chains: Linking the Logic of Power and the Logic of Embeddedness of Interfirm Relations

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Abstract

Small-and-medium-sized enterprises (SME) often need to draw on the knowledge of their supply chain partners to remain innovative and competitive in the marketplace. In the context of global value chains (GVC), this study examines the factors enabling the learning of SMEs from their GVC dependence by applying the logic of power and the logic of embeddedness. Specifically, we identify the technical adaptation of SMEs in the GVC as a response to their interdependence on the GVC following the logic of power, and an action that heightens information exchange and interorganizational learning at the dyad level following the logic of embeddedness. Linking these logics, we hypothesize that the technical adaptation of an SME mediates the relationship between its GVC dependence and its learning outcome from the GVC, namely the knowledge transfer it receives. Furthermore, this mediating role is stronger when the SME has a longer history of transactional relationship with its GVC partners which amplifies the logic of power, and when it possesses a higher level of financial slack which strengthens the logic of embeddedness. Using multi-sourced survey data from 292 Thai manufacturing SMEs, we find substantial support for the hypothesized relationships. Our findings offer theoretical and practical implications in terms of enabling and supporting the learning pathway of SMEs participating in the GVC.

Keywords Technical adaptation · Knowledge transfer · Global value chains · Small-and-medium-sized enterprises · Interdependence

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1 Introduction

With resource restrictions, small-and-medium-sized enterprises (SMEs) are typically specialized, as opposed to vertically integrated, business organizations that focus their resources on a limited range of value-adding activities (Musteen et al. 2017). To achieve optimal performance, SMEs need to form exchange relationships with upstream and downstream partners. With the on-going trend of business globalization, supply chains are increasingly formed across national borders and SMEs are becoming participants in global value chains (GVC) (Buckley and Tian 2017). By participating in GVC, SMEs form international linkages which can be potentially leveraged as valuable learning sources.

GVC entail vertical linkages incorporating various production stages across firms in different country locations (Mudambi 2008). Researchers argue that GVC are platforms for knowledge flow and interfirm collaboration, and therefore can be an important source of learning for SMEs (Alcacer and Oxley 2014; Saliola and Zanfei 2009). A growing body of research concerns how firms can realize learning from GVC linkages (Schmitz 2006; Schmitz and Knorringa 2000), rather than being constrained by the interdependence on such linkages (Cuervo-Cazurra and Rui 2017). Research so far has yet to generate an understanding of *what factors enable SMEs to realize learning from their dependence on GVC*. By tackling this research question, our study contributes to enhancing the understanding of interdependent relationships in GVC, offering strategic and practical implications for firms, especially SMEs, seeking to leverage the learning opportunities from international linkages (Mathews 2006, 2017).

Theoretically, our study draws on the *logic of power and logic of embeddedness* in existing research on interfirm relations (Andersson et al. 2001, 2002; Gulati et al.2000; Gulati and Sytch 2007; Uzzi 1996, 1997) and extends them to the context of the GVC. We conceptualize SMEs' GVC dependence as interorganizational +knowledge. These relationships involve asymmetric power between exchange partners based on their interdependence, and can vary in the degree of embeddedness—from a purely arm's-length transactional relationship to a long-lasting relationship with mutual trust and commitment (Uzzi 1996, 1997). The *logic of power* explains the responses of the firms to power asymmetry in interfirm relations (Casciaro and Piskorski 2005; Gulati and Sytch 2007). Responses in the form of relationship-specific investment create relational embeddedness in interfirm relations (Andersson et al. 2001, 2002); its consequence on information exchange and interorganizational learning is explained by the *logic of embeddedness* (Gulati and Sytch 2007; Lane and Lubatkin 1998; Uzzi 1996).

In this study, we advance existing knowledge by linking the logic of power and the logic of embeddedness and applying them to the context of SMEs' learning in GVC. We identify technical adaptation of SMEs in the GVC, a particular type of relationship-specific investment, as both a response to their dependence on the GVC following the logic of power and an action that creates relational embeddedness following the logic of embeddedness. Such relational embeddedness subsequently leads to heightened information exchange and interorganizational

learning at the dyad level. Accordingly, we hypothesize that the technical adaptation of an SME mediates the relationship between its GVC dependence and the knowledge transfer it receives. Furthermore, this mediating role is stronger for SMEs having a longer history of transactional relationship with GVC partners which amplifies the logic of power, and SMEs possessing a higher level of financial slack which strengthens the logic of embeddedness. In other words, the historical and financial positions of SMEs moderate the mediated relationship between GVC dependence and knowledge transfer via technical adaptation.

Empirically, we test the hypothesized moderated mediation relationships in the context of Thai SME manufacturing firms' participation in the GVC. Thai SMEs have been historically active in participating in GVC, typically serving as original equipment manufacturers and interim product suppliers for more established foreign firms. We collected multi-respondent survey data from 292 Thai manufacturing firms partaking in GVC. Structural equation modelling (SEM) approach was employed to establish convergent and discriminant validity. PROCESS macro for SPSS was utilized to (1) estimate each mediated path and its moderator in the model at the same time and (2) obtain 95% bias-corrected bootstrapped confidence interval. Our data analyses rendered strong support for the mediating role of technical adaptation in the relationship between GVC dependence of Thai SMEs and the knowledge transfer they received, and for the positive moderating effects of historical position and financial slack on the first and second stage of the mediation path respectively. These results are robust against alternative measure, sample, and analysis method.

The rest of the paper is organized as following. We first discus the theoretical foundation of the current study, incorporating the logic of power and logic of embeddedness as the guiding framework for the development of our three research hypotheses. We then provided extensive information on the research context (i.e., Thai SMEs in GVC) and research method (i.e., multi-sourced survey). This is followed by the results of our hypothesis testing, including additional analyses to test for the robustness of the research results. The paper concludes with a highlight of our theoretical contribution, practical implications for international management professionals, limitations of the current study, and future research directions.

2 Theory and Hypotheses

2.1 Two Dominant Logics of Interfirm Relations

Research on interfirm relations aims to understand interorganizational behaviors and their impact on the performance of the firms (Casciaro and Piskorski 2005; Gulati and Sytch 2007; Uzzi 1996). Its basic premise is that firms are embedded in social networks with other actors, and because individual firms rarely possess all the resources required for their survival and development, they are interdependent on each other for these vital resources (Pfeffer and Salancik 2003). There are two main arguments regarding the implications of the interdependence of the firms.

One argument is the *logic of power*, arguing power comes from the control of vital resources (Ulrich and Barney 1984) not necessarily distributed between

interdependent firms in an equal manner. Power imbalance emerges from dependence asymmetry, which is likely to be detrimental for the weaker actor whose action is constrained by the stronger actor. This line of argument is the core of the resource dependence theory, highlighting organizational tactics and interfirm organizational arrangements as consequences of interdependence of firms, whereby power disadvantaged firms redress power imbalance and/or absorb external constraints (Casciaro and Piskorski 2005; Hillman et al. 2009). Essentially, the logic of power addresses the transactional aspect of interfirm relations.

The other argument centers on the *logic of embeddedness*. Instead of focusing on the power dynamics between interdependent firms, this argument recognizes relational embeddedness as an alternative logic of action, whereby firms increase their commitment to their relationships over time, changing the characteristic of their exchange relationships from arm's-length transaction toward adaptation and trust, resulting in mutual benefits to the interdependent firms (Uzzi 1996, 1997). Following this argument, interdependent firms are motivated to develop relational embeddedness as a strategic resource, by undertaking actions serving the strategic and/or performance objectives specific to their exchange relationships (Andersson et al. 2001, 2002; Gulati and Sytch 2007). Overall, the logic embeddedness focuses on the relational aspect of interfirm relations.

The logic of power and the logic of embeddedness are not competing arguments. Prior studies have applied these logics to address different (transactional vs. relational) aspects of the interdependence phenomenon (e.g., Gulati and Sytch 2007). We argue that these logics can be linked in a consistent chain of perspectives; that is, the logic of power explains the motivation for firms to make relationship-specific investment as a response to power imbalance emerging from high levels of interdependence on exchange partners, while the logics of embeddedness corroborates the consequence of such relationship-specific investment on information exchange and interorganizational learning with their partners. In this sense, relationship-specific investment serves as a mediator channeling the effect of interdependence on interorganizational learning. The type of relationship-specific investment most salient to an exchange relationship is necessarily context-specific. In this study, we identify technical adaptation as a relationship-specific investment in the context of SMEs' participation in the GVC. Below, we develop research hypotheses regarding the mediating role of technical adaptation in transmitting the learning outcome of SMEs from their GVC dependence, as well as the contingency factors of this mediating relationship.

2.2 Technical Adaptation as a Relationship-Specific Investment in the GVC Context

Technical adaption refers to the action of adapting a firm's product, production process, and related internal routines and systems (Andersson et al. 2001, 2002). In the GVC context, technical adaption is a relationship-specific investment allowing partner firms to coordinate the dispersed value chain of global production through product and process standardization and routinized interfaces between value chain partners (Nadvi 2008). While GVC dependence serves as a potential source of

international knowledge diffusion, especially from lead firms to SMEs (Alcacer and Oxley 2014; Buckley 2009; Guzman and Wilson 2011; Su et al. 2019), the technical adaption of SMEs in the GVC mediates the relationship between their GVC dependence and their learning outcome for the following reasons.

First, the interdependence of a firm on its GVC is positively associated with its effort of technical adaptation in its GVC. Based on the *logic of power* of interfirm relations, GVC dependence motivates SMEs to engage in technical adaptation as a relationship-specific investment to stabilize their exchange relationships. In the GVC context, there is usually a power imbalance between SMEs and their GVC partners that are typically more established in size, technology and know-how. However, the relative small size of a firm does not necessarily imply power disadvantage; rather, power is determiend by the extent of interdependence. The greater the proportion of revenues generated by SMEs from GVC dependence, the more their business survival and success are interdependent on the exchange relationships with their GVC partners. Research suggests the extent to which a firm adapts and conforms to others depends on their resource dependence structure (Oliver 1991; Pfeffer and Salancik 2003). Specifically, when organizations are dependent on powerful external actors for critical resources, the external actors tend to exercise compliance pressure on the dependent organizations. These dependent organizations, in turn, face greater pressure to adapt and conform to the expectations of the external actors so as to secure access to critical exchange resources (Oliver 1991, 1997). Accordingly, high levels of interdependence on GVC partners give SMEs greater pressures to adapt and conform to the norms and standards of their GVC partners. Conversely, when interdependence is low, that is, when SMEs only engage in ad-hoc and/or small-scale transactions in GVC, they receive less pressure and are less motivated to adapt and conform to the norms and standards of GVC partners. Thus, there is a positive association between SMEs' GVC dependence and their technical adaptation in the GVC.

Second, the technical adaptation of SMEs in the GVC is positively associated with the knowledge transfer they receive from the GVC partners. Based on the *logic of embeddedness* of interfirm relations, relationship-specific investment, such as technical adaptation (Andersson et al. 2001, 2002), can create a more embedded exchange relationship, which is a strategic resource enhancing information exchange and interorganizational learning. Technical adaption is a relationship-specific investment serving as a commitment signal to GVC partners. Firms make relationship-specific investments by extensively adapting and conforming their behaviors in terms of routines, planning systems, and information to create a long-lasting relationships, as opposed to engaging in purely arm's length ones (Dyer and Singh 1998; Hoskisson et al. 2018). It is a commitment signal because relationship-specific investment increases the focal firm's costs of switching exchange relationships. From the relational aspect of interdependence, research finds that close relationships consisting of highly committed exchange partners are conducive of high quality and deep information exchange (Gulati and Sytch 2007; Uzzi 1996), and therefore partners strongly tied to each other can learn more from one another (Andersson et al. 2002). Moreover, technical adaptation enhances the learning firm's absorptive capacity at the dyad (i.e., relationship) level (Lane and Lubatkin 1998). In their study of R&D alliances, Lane and

Lubatkin (1998) find partners sharing similarities in basic knowledge, namely general understanding of traditions and techniques, are better able to recognize and value partner knowledge. Furthermore, similarities in organizational practices and routines between partner firms help improve the student firm's ability to assimilate the teacher's knowledge, because such similarity reflect the alignment of the student and teacher firms' knowledge-processing systems and norms (Lane and Lubatkin 1998). Accordingly, as technical adaptation requires firms to obtain shared basic knowledge and align organizational practices and routines reflecting knowledge-processing systems and norms, it improves the firms' ability to achieve interorganizational learning.

Linking the arguments based on the logic of power and logic of embeddedness presented above, we propose:

Hypothesis 1: *Technical adaptation of SMEs in their GVC mediates the positive relationship between SMEs' GVC dependence and knowledge transfer toward them.*

2.3 Contingency Factors: Historical and Financial Positions

The above hypothesized mediating role of technical adaptation is subject to firm-level contingencies. Informed by network building (Andersson et al. 2002) and the behavior argument of organization theory (George 2005; Kim et al. 2008; Tan and Peng 2003), we contend that SMEs' historical and financial positions moderate the mediated relationship at different stages.

We argue that the first stage of the mediated relationship, namely the association between SMEs' GVC dependence and their technical adaptation in the GVC, is moderated by SMEs' historical position in the GVC. A longer period of exposure to the norms and standards of GVC partners amplifies the logic of power underlying the motivation of the SMEs to make relationship-specific investments for more embedded relationships. Research shows that the development of embedded relationship requires a significant period of time (Andersson et al. 2002; Saliola and Zanfei 2009). A longer historical exposure of SMEs to the GVC is expected to enable deeper understanding of GVC norms and practices. It also promotes trust building while reducing appropriation risk, making transactions more effective between the partners (Burchell and Wilkinson 1997). With such experiential resources facilitating deeper understanding and greater trust between exchange partners, SMEs are more willing to make relationship-specific investments as a response to high interdependence on GVC partners. In contrast, the association between GVC linkage and technical adaptation is likely to weaken if an SME does not have sufficient time to develop understanding and trust with its GVC partners. Therefore, we hypothesize that:

Hypothesis 2: *The positive association between SMEs' GVC dependence and their technical adaptation in the GVC is stronger for SMEs with a longer historical position in their GVC.*

We further argue the second stage of the mediated relationship, namely the association between SMEs' technical adaptation in their GVC and knowledge transfer toward them, is moderated by the financial position of the firm. Specifically, the logic of embeddedness underlying this second stage relation is strengthened by the financial slack of the SMEs, defined as the "cushion of actual or potential resources which allows an organization to adapt successfully to internal pressures for adjustment or to external pressures for change in policy, as well as to initiate changes in strategy with respect to the external environment" (Bourgeois 1981, p. 30). In other words, financial slack increases the extent to which adaptation can lead to successful learning outcomes. In the context of SMEs' learning from GVC partners, technical adaptation involves assimilating novel knowledge and abandoning the existing and conventional knowledge. It requires investments in new product, process, and routines. Financial slack improves a learning firm's ability to take risks by helping it relax internal capital restrictions for investment decisions (George 2005). As learning involves risk-taking and uncertainty of return, especially in the short term, financial slack provides a resource buffer, allowing funds to be directed toward new investments or projects that facilitate the learning of the firm (George 2005; Kim et al. 2008; Tan and Peng 2003), despite the uncertainty in the outcomes of the investment (Voss et al. 2008; Wiseman and Bromiley 1996). In contrast, such new investments would not be possible in the face of financial scarcity (Bourgeois 1981), thereby hampering the capacity of SMEs to learn from working relationships with resourceful GVC partners. We therefore hypothesize that:

Hypothesis 3: *The positive association between SMEs' technical adaptation in the GVC and knowledge transfer toward them is stronger for SMEs with higher levels of financial slack.*
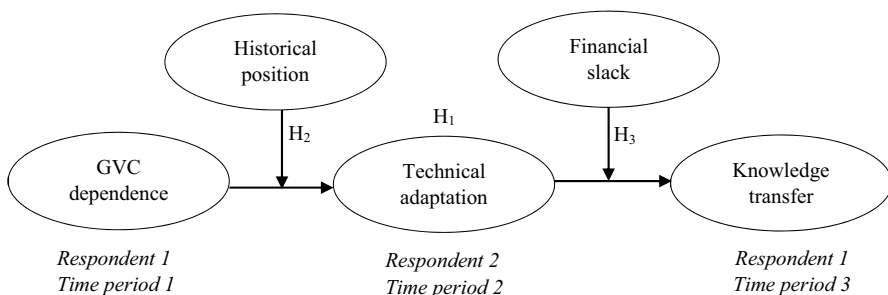
Figure 1 below summarizes our research hypotheses.

Fig. 1 Research model and hypotheses

3 Research Design and Methods

3.1 Sampling Frame and Characteristics

SMEs have been actively engaged in GVC as a platform for growth, learning, and ultimately global competitiveness building. Despite the significance of GVC as a source of learning, issues related to GVC dependence and knowledge transfer have received limited empirical attention in relation to SMEs. Addressing this gap, we chose Thailand as our empirical setting because Thai SMEs have historically and increasingly participated in GVC, typically as original equipment manufacturers or semi-product suppliers for more established, foreign-based GVC partners. Compared to their GVC partners, Thai SMEs are generally lagging behind in terms of technologies and know-how, limiting their value-adding potentials in GVC. Learning from GVC dependence is, therefore, especially important for Thai firms in their quest for a sustained competitive advantage.

We randomly selected 1000 Thai SME manufacturing firms from a list of GVC participant firms, officially referred to as the 'Thai Supplier List' compiled by the Department of International Trade Promotion of Thailand. We followed the classification standard of the European Commission, which defines SMEs as firms having less than 250 employees, an annual turnover of up to EUR 50 million, or a balance sheet total of no more than EUR 43 million (European Commission 2003). Among the 1000 selected firms, 895 firms with valid contact details were the targets of our survey. Following a two-step procedure to improve survey response rate, we first conducted telephone pre-screening to identify two potential respondents from each firm (including the top/executive manager/director and another manager responsible for the operations and technology development of the firms). Subsequently, with their initial consent, we sent the surveys to the two identified respondents in each firm. The surveys were administered during the second half of 2017, mostly in-person or via phone by one of the authors who is a native Thai speaker. Post and email correspondences were utilized for the respondents who were unavailable in person or by phone.

A total of 351 paired responses were received, among which 59 were excluded from data analysis due to presence of missing data, yielding an effective response rate of 32.6%. The final sample of 292 firms represented a range of major Thai exporting industries, including consumer electronics and electronics components (7.8%), machinery and industrial equipment (8.2%), automotive parts and motorcycles (9.93%), furniture and decor (12.33%), textiles and clothing (10.96%), gems and jewelry (26.37%), and others (24.4%). The majority of the firms fitted the SME classification of the European Commission. There were 208 firms (71.23%) with less than 250 employees, and the rest 84 firms (28.77%), while exceeding the employee number threshold, had annual turnovers at the SME level, namely, below EUR 50 million. We conducted robustness test by dropping these 84 firms and our key results remained consistent (see Sect. 4.3 for details).

3.2 Questionnaire Design and Common Method Variance (CMV)

The questionnaire had been designed in English and then translated into Thai. A reverse-translation procedure was followed to ensure the accuracy of translation. The survey questions asked managers to retrospectively evaluate a range of variables related to their firm's interdependence on and learning from their exchange relationships with GVC partners. The reference time period for each variable is determined in accordance with the theoretical model (see Fig. 1). Specific reference time period for key variables are detailed in Sect. 3.3 below.

To counter potential problems of common method variance (CMV), we employed a range of procedural and statistical remedies following prior studies (Krishnan et al. 2006). First and foremost, a single-sourced survey is most prone to CMV (Podsakoff et al. 2003). Accordingly, when designing our survey, we identified two respondents from each firm, typically the general manager and one senior manager responsible for operations and technology, and asked them to respond to different set of questions, thus separating the respondents for variables involved in direct causal relationships (see Fig. 1).

Procedurally, we also ensured respondent anonymity when administering the survey to minimize participants' tendency to make socially desirable responses (Krishnan et al. 2006). While we administered our survey in different ways (in-person, phone, mail, post), we provided detailed information to all participants ensuring that only de-identified information would be used in this research and only aggregated findings would be reported in research publications. No third party would have access to the data. We conducted response bias test to check if the administration method induced systematic variance in data. T-tests results showed no significant mean difference on key variables between in-person/phone respondents (248) and mail/post respondents (44). Furthermore, we created spatial separation in the questionnaire by placing variables involved in direct causal relationships on different pages of the questionnaire and separated by other questions. To ensure item unambiguity, we pre-tested our questionnaire with business executives and management scholars.

Statistically, we used marker variable method (Williams et al. 2010) and Harman's one-factor test (Podsakoff et al. 2003) to check for CMV biases. We used historical position as a marker variable and all significant zero-order correlations remained significant after partial correlation adjustment, indicating that common method bias was not a serious issue in this dataset. There was also no single dominant factor as revealed by the results of an unrotated principal component factor analysis, and a measurement model with a single factor had poor model fit ($\chi^2 = 1467.932$, df $= 90$; $\chi^2/\text{df} = 16.31$ CFI $= 0.49$; TLI $= 0.40$; SRMA $= 0.15$; RMSEA $= 0.23$). The one-factor test results suggest low probability of CMV biases. In addition, two of our three hypotheses concerning moderating effects were tested based on the regression coefficients of linear interaction terms. The significance of interaction terms is less prone to CMV biases because it is implausible that survey participants were able to consciously theorize moderating relationships when responding to questionnaires. Following Krishnan et al. (2006), we summarize our procedural and statistical remedies for potential CMV biases in Appendix.

3.3 Measures and Operationalization

3.3.1 Dependent Variable

Knowledge transfer (toward an SME) Patent data, a popular way to measure knowledge transfer, are usually unavailable for SMEs. Alternatively, researchers have measured knowledge transfer using multiple survey items pertaining to transferred knowledge used in final products and processes, as well as tacit and codified knowledge (Asmussen et al. 2013). We adopted the five-item scale from Lane et al. (2001) for the current study (see Table 1). Respondent 1 was asked to refer to the time period 2015–2016 when answering the questions relating to knowledge transfer.

3.3.2 Explanatory Variables

GVC dependence This variable captures the extent to which the SMEs are interdependent on their GVC partners for revenue generation. SMEs from emerging markets participate in the GVC typically as suppliers and contract manufacturers (e.g., original equipment manufacturer, or OEM) of downstream partner firms from advanced economies (Mudambi 2008). Accordingly, we measured GVC dependence by the ratio of an emerging market firm's sales revenue generated from its GVC dependence (e.g., OEM sales) to its total sales. Respondent 1 was asked to refer to the time period 2011–2012 when answering this question. Sales information during the time periods 2013–2014 and 2015–2016 were also obtained to check data consistency. In addition, we collected data on foreign profits as a percentage of total profits from Respondent 1 as an alternative measure of GVC dependence for robustness test.

Technical adaptation Technical adaptation is a relationship-specific investment by SMEs to adapt and conform to the standards and norms of their GVC partners. Following Andersson and colleagues' (2001, 2002) multi-item measures of technical embeddedness, we used three items to capture SMEs' technical adaptation to GVC partners regarding product, production process, and overall business conduct reflected in routines and practices (see Table 1). Respondent 2 was asked to refer to the time period 2013–2014 when evaluating the items of technical adaptation.

Historical position The historical position of a focal SME in GVC was measured as the number of years the firm had participated in its GVC partnerships. Following Zahra et al. (2000), we asked, "In what year was your company's products sold abroad to your GVC partners for the first time?". Given this variable is based on factual rather than perceptual information, we obtained it from both respondents from each firm and checked data consistency. Because we hypothesized historical position as a moderator on the first stage of the mediation path, we calculated this variable as the natural log of the number of years between the year of starting GVC participation and 2012.

Financial slack Our argument leading to hypothesis 3 is based on unabsorbed financial slack (e.g., free cash flow at the discretion of the firm) rather than absorbed slack which are hard-to-redeploy resources such as excess capacity. Accordingly, we adopted the 3-item measure of unabsorbed financial slack from Tan and Peng (2003).

Table 1 Measurements of latent constructs

Constructs and indicators	Standardized factor loading	*t*-value	R^2-value
Knowledge transfer (α = 0.90, CR = 0.90, AVE = 0.65, SQRT AVE = 0.81)			
To what extent have you learned from your foreign customers or partners in terms of:			
1. New technological expertise	0.79	30.34	0.62
2. New marketing expertise	0.80	31.74	0.64
3. Product development	0.83	36.10	0.68
4. Managerial techniques	0.80	32.35	0.65
5. Manufacturing process	0.81	33.26	0.66
Technical adaptation			
(α = 0.87, CR = 0.87, AVE = 0.69, SQRT AVE = 0.83)			
To what extent have the relationships with the top five customers or counterparts in the GVC led to adaptations in the following areas in order to maintain relationships with them:			
1. Product technology	0.85	35.86	0.73
2. Production technology	0.78	27.47	0.61
3. Overall business conduct	0.85	36.43	0.73
Financial slack (α = 0.89, CR = 0.89, AVE = 0.73, SQRT AVE = 0.85)			
1. Whether the firm's retained earnings have been sufficient for market expansion	0.83	35.59	0.68
2. Whether it has a pool of financial resources that can be used on a discretionary basis	0.96	58.21	0.93
3. Whether it is able to secure necessary bank loans	0.76	26.89	0.58
Past performance (α = 0.86, CR = 0.85, AVE = 0.58, SQRT AVE = 0.76)			
Performance is measured in terms of:			
1. The overall performance in terms of the firms' sales growth	0.70	19.60	0.49
2. Market shares	0.72	21.06	0.52
3. Competitive positions	0.70	19.61	0.49
4. The profitability of sales	0.92	37.82	0.84

Respondent 1 was asked to refer to the time period 2013–2014 when evaluating these items, because it is hypothesized as a moderator on the second stage of the mediation path.

Control variables: We included a range of control variables as guided by previous studies (e.g., Besharov and Smith 2014; Lane et al. 2001). These include the focal SME's *size* (the natural log of an average number of employees in years 2015 and 2016), *age* (the natural log of the number of years of operation prior to 2016), *past performance* (measured by 4-item measures assessing the overall sales growth, market shares, competitive position, and profitability of sales during the time period 2011–2012; see Table 1) (Aulakh et al. 2000), and *ownership* (joint venture firms were coded 1, with firms wholly owned by Thai as the baseline). We also used two dummy variables to distinguish high-tech industry and heavy industry from other industries (treated as the baseline). Specifically, high-technology industries require state-of-the-art manufacturing facilities, with higher R&D investments and more intense competition based on product innovation (Qian and Li 2003; Stuart 2000), whereas with heavy industry most investment is in marketable plant and equipment such as iron and steel, energy, and chemical industries (Rumelt 1982). Additionally, we accounted for the potential influence of external environment and stakeholders on the process of knowledge transfer. At the supply chain level, a suppler firm's power dependence on GVC customers is negatively associated with the number of customers it has in its GVC networks (Drees and Heugens 2013; Gulati and Sytch 2007). Suppliers with a greater number of downstream customers can diversify their revenue sources and therefore reduce dependence and switching costs on any particular customer. Hence, we controlled for the *number of major GVC customers* of the focal firm in our analysis. Moreover, firms are subject to the influences of infrastructures and institutions in the external environment in which they are embedded (Hoskisson et al. 2013). Similar to other emerging economies such as China (Zhang et al. 2015), there is a substantial difference in infrastructure and institutional development between rural and urban areas in Thailand. Accordingly, we controlled for the environmental difference between firms from a *rural area location* and those from an urban area location using a dummy variable (rural area location = 1, otherwise 0). Lastly, business groups are important stakeholders of affiliated firms, and can have strong influence over affiliated firms' strategic choices and operations through group-level resource allocation and control mechanisms (Carney et al. 2011). We used a dummy variable, *business group affiliation*, to control for the potential influences of business group stakeholders. The variable has a value of 1 if the focal firm is affiliated with a business group, and a value of 0 if otherwise. Altogether, these firm- and industry-level variables may influence SMEs' resource dependence and power dynamics with GVC partners.

4 Analysis and Results

4.1 Measurement Model

As many of our key variables (see Table 1) are latent constructs measured by multi-item scales, we first tested a measurement model to assess the convergent and

discriminant validities of these latent constructs. The convergent validity, which refers to the internal consistency reliability of multi-item constructs, was assessed by a series of confirmatory factor analyses (see Table 1). As shown in Table 1, all items loaded significantly on their respective theoretical constructs ($p < 0.01$). The linearity of the relations between constructs and indicators was strong in all cases, with R^2 value being 0.49 or above. The t-values for all indicators were highly significant (ranging from 19.60 to 58.21), and their standardized factor loadings were satisfactory (all at 0.70 or above). The measurement model as a whole yielded good fitness-to-date ($\chi^2 = 180.40$, $df = 83$, $p = 0.00$; $\chi^2/df = 2.17$, CFI = 0.96, TLI = 0.95, SRMA = 0.04, RMSEA = 0.06). Additionally, the composite reliability (CR) of all constructs exceeded the 0.7 benchmark (Gerbing and Anderson 1988). Specifically, the CR of knowledge transfer, network embeddedness, and financial slack were 0.90, 0.87, and 0.89, respectively. The constructs' average variance extracted (AVE) was also greater than the benchmark of 0.50. Specifically, the AVE of knowledge transfer, network embeddedness, and financial slack was 0.65, 0.69, and 0.73, respectively. These measures demonstrated high convergent validity of the latent constructs.

Following Fornell and Larcker (1981), we then assessed discriminant validity of the latent constructs by examining whether the square root of the AVE of each construct (as shown in the diagonal of Table 2) was greater than the highest correlation between latent variables involving the focal construct. The square root of AVE value was higher than the correlation across all pairs of constructs. Additionally, a series of χ^2 difference tests between some alternative and the original measurement models was performed. In these alternative measurement models, we merged the items of two latent constructs into a single construct. The rationale is that, if these alternative measurement models are significantly inferior to the original model, indicated by significant Chi square differences, then we have evidence supporting that the constructs should be treated as distinct from each other but not be merged. The results showed that all Chi square differences were highly significant, supporting the discriminant validity for the constructs.

4.2 Hypothesis Testing

This study used factor-weighted scores to create composite variables and then mean-centered focal variables before creating interaction terms to avoid potential multicollinearity. PROCESS macro for SPSS (Hayes 2013) was utilized to test the moderated mediation model, and to obtain a 95% bias-corrected bootstrapped confidence interval (CI), using 5000 bootstrap samples, for the conditional indirect relationship. A check of the variance inflation factor indicated no serious multicollinearity. Means, standard deviations (*SD*s), and correlations are provided in Table 2.

Hypothesis testing results are reported in Table 3. Regarding the control variables, the results indicated that firm age, firm size, high-tech and heavy industry and business group affiliation did not appear to have a significant relationship with both technical adaptation and knowledge transfer. Meanwhile, across Model 1–3, foreign ownership had a significant, positive association with knowledge transfer

Table 2 Correlation matrix and descriptive statistics (N = 292)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Knowledge transfer	*0.810*													
2 GVC dependence	− 0.020	*n/a*												
3 Technical adaptation	0.380**	0.154**	*0.830*											
4 Historical position	0.066	0.176**	− 0.069	*n/a*										
5 Financial slack	0.313**	0.230**	0.426**	0.023	*0.860*									
6 Firm age	0.084	0.046	0.045	0.697**	0.063	*n/a*								
7 Firm size	− 0.018	− 0.049	− 0.235**	0.197**	− 0.212**	0.207**	*n/a*							
8 Past performance	0.359**	− 0.100	0.376**	0.019	0.391**	0.093	− 0.165**	*0.760*						
9 Ownership	− 0.095	− 0.040	− 0.388**	0.076	− 0.334**	− 0.037	0.566**	− 0.300**	*n/a*					
10 High-tech industry	− 0.071	− 0.221**	− 0.324**	0.063	− 0.382**	0.043	0.491**	− 0.147*	0.560**	*n/a*				
11 Heavy industry	− 0.066	− 0.080	− 0.079	0.034	− 0.033	0.005	0.180**	− 0.113	0.185**	− 0.152**	*n/a*			
12 Business group affiliation	− 0.03	− 0.155**	− 0.068	0.112	− 0.113	0.217**	0.031	0.172**	0.275**	0.048	0.273**	*n/a*		
13 Rural area location	0.189**	0.013	0.176**	− 0.032	0.097	− 0.229**	0.139*	0.082	− 0.218**	− 0.205**	− 0.078	− 0.078	*n/a*	
14 No. of major GVC cust	0.211**	− 0.126*	0.201**	− 0.071	0.045	− 0.329**	0.304**	0.049	− 0.194**	− 0.153**	− 0.118*	0.093	− 0.01	*n/a*

Table 2 (continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mean	4.398	42.729	4.675	2.235	3.879	2.813	4.416	3.929	0.380	0.280	0.050	0.050	0.100	3.260
Std. Deviation	1.010	21.578	1.066	0.802	1.407	0.502	1.535	0.929	0.485	0.452	0.228	0.228	0.295	1.536
Skewness	− 0.061	0.696	0.389	− 0.685	0.179	0.308	0.304	0.012	0.511	0.962	3.933	3.933	2.759	− 0.163
Kurtosis	0.246	0.801	− 0.546	0.972	− 0.612	− 0.074	0.065	− 0.627	− 1.750	− 1.083	13.560	13.560	5.651	− 1.462

The values on the diagonal are square roots of the AVE

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

(B = 0.19, SE = 0.07, p = 0.013 in Model 2), but was negatively related to technical adaptation (B = − 0.21, SE = 0.07, p = 0.005 in Model 2). Past performance significantly affected both technical adaptation and knowledge transfer across all models (B = 0.30, SE = 0.05, p = 0.000; and B = 0.16, SE = 0.06, p = 0.008, respectively, in Model 2). Rural area location and the number of major GVC customers also significantly affected knowledge transfer to the focal SMEs (B = 0.16, SE = 0.05, p = 0.003; and B = 0.16, SE = 0.06, p = 0.007, respectively, in Model 2), but do not have impact on technical adaptation across the three models.

Hypothesis 1 proposed an indirect relationship between GVC dependence (Respondent 1) and knowledge transfer (Respondent 1) mediated by technical adaptation (Respondent 2). We estimated the indirect effect of GVC dependence on knowledge transfer using bias-corrected bootstrapped 95% CIs. As shown in Table 3, Model 1, the relationship between GVC dependence and technical adaptation and the relationship between technical adaptation and knowledge transfer are both positive and statistically significant ($B = 0.15$, $p = 0.006$, and $B = 0.311$, $p = 0.00$, respectively). The indirect effect of GVC dependence on knowledge transfer via technical adaptation was also positive and statistically significant (indirect effect = 0.05, SE = 0.02, 95% CI [0.015 to 0.098]), whereas the direct effect of GVC linkage on knowledge transfer was non-significant (direct effect = − 0.04, SE = 0.06, 95% CI [− 0.151 to 0.071]). These results suggest that technical adaptation fully mediated the effect of GVC linkage on knowledge transfer. Therefore, hypothesis 1 was supported.

Hypothesis 2 proposed a positive moderating effect of historical position on the relationship between GVC linkage and technical adaptation. Model 2 in Table 3 shows that the interaction term (GVC dependence × historical position) was significantly associated with technical adaptation ($B = 0.16$, $p = 0.003$), indicating a positive moderating effect. To better understand this moderating effect, we calculated the marginal effect of GVC dependence on technical adaptation at different values of the moderator, i.e., historical position. As reported in Fig. 2, the marginal effect increased as historical position increased from a low to a high level. This marginal effect remained positive and significant when historical position was above 2.066, which represented 67.81% of the observations in our sample.

We further assessed the conditional indirect effect of GVC dependence on knowledge transfer via technical adaptation with the presence of historical position as the first-stage moderator. Table 4 reports the estimate and bias-corrected bootstrapped 95% CIs (5000 bootstrap samples) for the conditional indirect effects at ± 1 standard deviation of the moderators. As illustrated, the conditional indirect effect of GVC dependence on knowledge transfer was significant at a high level of historical position (i.e., at mean + 1 SD; indirect effect = 0.076, SE = 0.028, 95% CI [0.033 to 0.147]), but not at low levels of historical position (i.e., at mean − 1 SD; indirect effect = − 0.002, SE = 0.025, 95% CI [− 0.053 to 0.051]). Hypothesis 2 received consistent support from the above results (Table 3, Fig. 2, and Table 4).

To test the moderating effect as stipulated in hypothesis 3, we assessed whether the strength of the relationship between technical adaptation and knowledge transfer toward SMEs depended on the level of financial slack. Model 2 (Table 3) indicates that the interaction term of technical adaptation and financial slack was significantly

Table 3 Regression analysis results (N=292)

	Model 1 (Mediation)				Model 2 (Moderated mediation)				Model 3 (Robustness test)			
	TA		KT		TA		KT		TA		KT	
	B (SE)	p	B (SE)	p	B (SE)	p	B (SE)	p	B (SE)	p	B (SE)	p
Constant	0.00 (0.05)	1.000	0.00 (0.05)	1.000	− 0.03 (0.05)	0.591	− 0.07 (0.06)	0.224	− 0.02 (0.05)	0.631	− 0.07 (0.06)	0.224
Ownership	− 0.21 (0.07)	0.006	0.16 (0.08)	0.038	− 0.21 (0.07)	0.005	0.19 (0.07)	0.013	− 0.21 (0.07)	0.005	0.18 (0.08)	0.019
Past performance	0.30 (0.06)	0.000	0.23 (0.06)	0.000	0.30 (0.05)	0.000	0.16 (0.06)	0.008	0.30 (0.05)	0.000	0.17 (0.06)	0.005
Firm age	0.00 (0.05)	0.956	0.03 (0.06)	0.548	0.06 (0.08)	0.466	0.01 (0.05)	0.838	0.06 (0.08)	0.462	0.01 (0.05)	0.918
Firm size	0.03 (0.07)	0.714	0.09 (0.07)	0.179	0.03 (0.07)	0.655	0.08 (0.07)	0.218	0.02 (0.07)	0.720	0.08 (0.07)	0.240
High-tech industry	− 0.12 (0.07)	0.085	− 0.03 (0.07)	0.691	− 0.12 (0.07)	0.099	− 0.02 (0.07)	0.833	− 0.12 (0.07)	0.088	0.00 (0.07)	0.970
Heavy industry	− 0.01 (0.06)	0.919	− 0.02 (0.06)	0.763	0.00 (0.06)	0.968	− 0.03 (0.06)	0.637	0.00 (0.06)	0.959	− 0.02 (0.06)	0.759
Business group affiliation	− 0.01 (0.06)	0.902	− 0.08 (0.06)	0.147	0.00 (0.06)	0.994	− 0.07 (0.06)	0.219	0.00 (0.06)	0.934	− 0.06 (0.06)	0.275
Rural area location	0.07 (0.05)	0.221	0.14 (0.05)	0.009	0.06 (0.05)	0.285	0.16 (0.05)	0.003	0.06 (0.06)	0.295	0.16 (0.05)	0.003
No. of major GVC cust	0.05 (0.06)	0.374	0.15 (0.06)	0.013	0.04 (0.06)	0.477	0.16 (0.06)	0.007	0.06 (0.06)	0.301	0.16 (0.06)	0.006
GVC dependence (GVCD)	0.15 (0.06)	0.006	− 0.04 (0.06)	0.483	0.15 (0.06)	0.008	− 0.07 (0.06)	0.220	0.14 (0.06)	0.012	− 0.01 (0.06)	0.889
Technical adaptation (TA)			0.31 (0.06)	0.000			0.25 (0.06)	0.000			0.24 (0.06)	0.000
Historical position (HP)					− 0.11 (0.07)	0.136			− 0.10 (0.7)	0.202		
Financial slack (FS)							0.19 (0.06)	0.003			0.18 (0.06)	0.005
GVCD*HP					0.16 (0.05)	0.003			0.17 (0.05)	0.001		
TA*FS							0.16 (0.05)	0.003			0.16 (0.05)	0.003
Model statistics												
R^2	0.269		0.251		0.303		0.299		0.305		0.295	
Overall model F (F)	10.36	0.000	8.53	0.000	10.12	0.000	9.13	0.000	10.22	0.000	8.96	0.000
df	(10, 281)		(11, 280)		(12, 279)		(13, 278)		(12, 279)		(13, 278)	

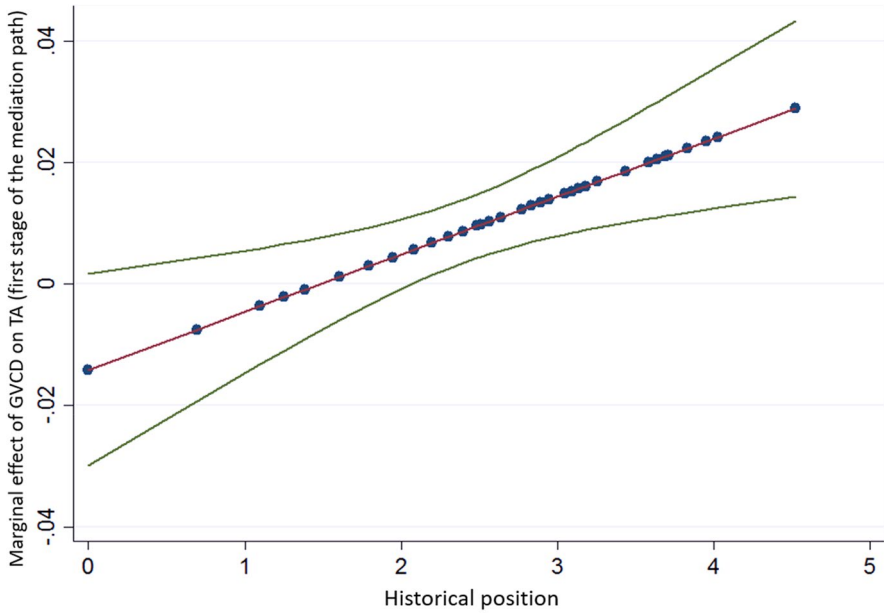*KT* knowledge transfer, *B* non-standardized coefficient, *SE* standard error

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Fig. 2 Marginal effect plot for hypothesis 2

Table 4 Conditional indirect effects

Moderator	Conditional indirect effect		
	Level of estimate	B (SE)	CI
Historical position	− 1 SD	− 0.002 (0.025)	[− 0.053, 0.051]
	+ 1 SD	0.076 (0.028)	[0.033, 0.147]
Financial slack	− 1 SD	0.014 (0.018)	[− 0.014, 0.061]
	+ 1 SD	0.061 (0.026)	[0.016, 0.121]

B bias-corrected bootstrapped estimates, *SE* standard error, *CI* 95% confidence interval

associated with knowledge transfer ($B = 0.16$, $p = 0.003$). Figure 3 also illustrates that the relationship between technical adaptation and knowledge transfer became significantly stronger when financial slack increased from a low to a high level. The marginal effect of technical support on knowledge transfer remained positive and significant when financial slack was above 2.891, representing 77.40% of the observations in our sample.

We further assessed the conditional indirect effect of GVC dependence on knowledge transfer with the presence of financial slack as the second-stage moderator using bias-corrected bootstrapped 95% CI (5000 bootstrap samples) for the conditional indirect effects at ± 1 standard deviation of financial slack. As illustrated in Table 4, the conditional indirect effect of GVC dependence on knowledge
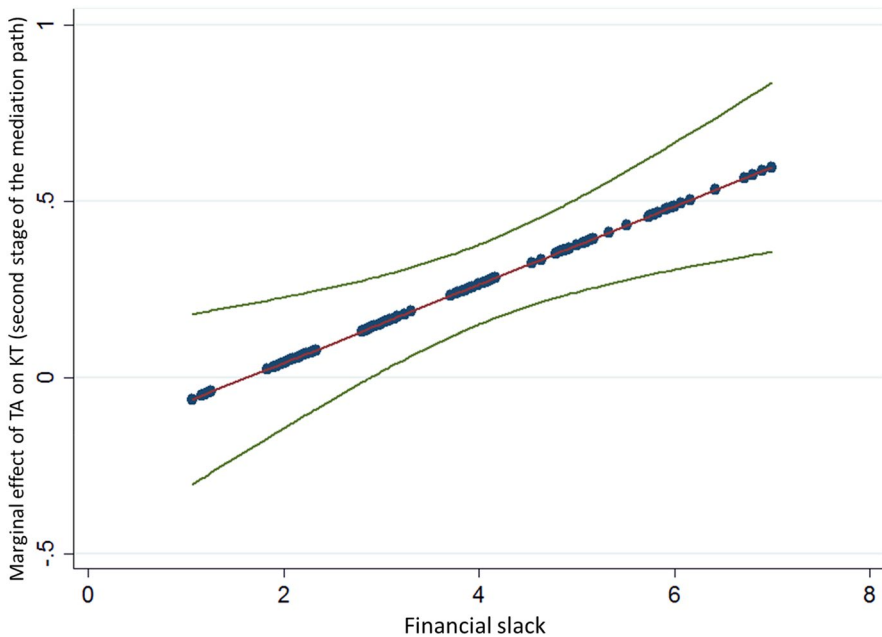
Fig. 3 Marginal effect plot for hypothesis 3

transfer via technical adaptation was significant when financial slack was high (i.e., at mean + 1 SD; indirect effect = 0.061, SE = 0.026, 95% CI [0.016 to 0.121], but was not significant when financial slack was low (i.e., at mean − 1 SD; indirect effect = 0.014, SE = 0.018, 95% CI [−0.014 to 0.061]). Therefore, hypothesis 3 received consistent support from the above results (Table 3, Fig. 3, and Table 4).

4.3 Robustness Tests and Additional Analyses

We assessed the robustness of the results with two sensitivity tests. First, we used an alternative measure of our independent variable, namely GVC dependence. Specifically, we measured it as the percentage of foreign profit to total profit. The results are reported in Table 3, Model 3, which show that all the hypothesized relationships remained significant. Further, we excluded firms that exceeded the 250-employee threshold (84 firms) from our sample and re-ran our analyses. The association between GVC dependence and technical adaptation (B = 0.133, SE = 0.068, p = 0.050) as well as the association between technical adaptation and knowledge transfer (B = 0.310, SE = 0.074, p = 0.000) remained positive and significant. The interaction terms for the first stage (B = 0.178, SE = 0.072, p = 0.014) and the second stage (B = 0.160, SE = 0.070, p = 0.022) moderating effects also remained positive and significant. These results are consistent with those of the original analyses reported in Table 3, demonstrating robustness.

Additionally, we also used an alternative method to test the moderated mediation relationships by following the multiple-group SEM analysis procedures suggested by Song et al. (2005). This method allowed us to test whether mediated paths should be allowed to vary in strength between sub-groups divided by the value of the moderators. To test hypothesis 2, we first constructed a baseline model where we constrained the effects of control variables, factor loadings, and the technical adaptation to knowledge transfer path, but allowed the GVC dependence to technical adaptation path to vary between sub-groups divided by the median value of historical position. Then in a fully constrained model, we constrained the GVC dependence to technical adaptation path between subgroups of different historical position. The significant result of the model Chi-square difference test of Model 2 ($\Delta \chi^2_{(1)} = 4.170$, $p < 0.05$) indicated that the baseline model fitted the data better, that is, the first stage of the mediation path should be allowed to vary with the level of historical position. Indeed, the coefficient of the GVC dependence to technical adaptation path in the baseline model was significantly larger ($0.268 > 0.020$) for firms with above-medium values of historical position than those with below-medium values. This was consistent with the previous analysis using SPSS PROCESS macro for hypothesis 2. Replicating this procedure for the second stage of the mediation path, we found that the technical adaptation to knowledge transfer path should be allowed to vary with the level of financial slack, as evidenced by the significant Chi square difference between the unconstrained (baseline) and the constrained (Model 2) models ($\Delta \chi^2_{(1)} = 4.721$, $p < 0.05$). Specifically, we found the second stage of the mediation path, namely from technical adaptation to knowledge transfer, had a larger path coefficient firms with above medium financial slack (0.631) than for those with below medium financial slack (0.144). This analysis was also consistent with the previous analysis for hypothesis 3.

5 Discussion and Conclusion

This study examines the mechanisms through which SMEs can realize learning benefits from international linkages in the context of the GVC. We have argued that technical adaptation enables SMEs to respond to power imbalance in the exchange relationships with GVC partners and at the same time create relational embeddedness in these relationships, which is beneficial for information exchange and inter-organizational learning with GVC partners. While the logic of power underlying the relationship between GVC dependence and technical adaptation as a relationship-specific investment is amplified by historical position of the focal firm in its GVC, the logic of embeddedness underlying the relationship between technical adaptation and knowledge transfer is strengthened by the financial slack of the learning firm. When testing these arguments, we focused on the context of emerging economy SMEs. Due to liabilities of emergingness (Madhok and Keyhani 2012) and liabilities of smallness (Djupdal and Westhead 2015), SMEs in emerging economies typically participate in the GVC not as the lead firm, but as recipients of knowledge transfer from technologically more advanced GVC partners. The knowledge gap

between emerging economy SMEs and their GVC lead firms can hinder the communication and collaboration within the value chain, undermining the efficiency and ultimately market competitiveness of all parties involved. Accordingly, closing the knowledge gap through knowledge transfer serve the aligned interests of emerging economy SMEs and their GVC partners. Therefore, it is important to investigate the factors enabling and facilitating knowledge transfer in the context of emerging economy SMEs' participation in the GVC. Although emerging economy SMEs have certain idiosyncrasies due to their home country constraints and their technological laggard status, these characteristics tend to further necessitate knowledge transfer rather than marginalizing it in their GVC operations. As such, emerging economy SMEs are representatives of SMEs who actively leverage GVC linkages for knowledge transfer, thus providing an ideal context to test our theoretical arguments. In this regard, our study not only contributes to the GVC literature by advancing the theory of interfirm relations, but also add new theoretical and empirical insights to the study of emerging economy firms' international linkage.

5.1 Theoretical Contributions

This study makes two main contributions. First, it contributes to international business research on the linkage between international networking and organizational learning. Specifically, the research findings advance the GVC linkage debate and the factors driving successful knowledge transfer during the internationalization process of emerging economy SMEs. Existing research has, to date, shown networking is critical for firms to access knowledge from their global linkages (Ge et al. 2018; Saliola and Zanfei 2009). Firms vary in their abilities to attain an insidership position (Johanson and Vahlne 2009) and legitimacy status (Dacin et al. 2007; Oliver 1997) in their international networks. However, specifications in international networking enabling firms to realize knowledge transfer benefits have not been sufficiently explained to date. Our research findings reveal technical adaption in the GVC, contingent on the learning firm's historical and financial positions, as a key action facilitating the firm to leverage learning opportunities in international linkages. This view offers a new perspective on how SMEs learn in that it emphasizes the relationship-specific investment undertaken by technologically laggard SMEs to reach a congruity threshold that facilitates their learning from linkages with GVC partners. In other words, we support the argument that technical adaptation is particularly important for emerging economy SMEs operating as suppliers to their advanced GVC partners, given their low power status in GVC and their motivation to maintain access to knowledge sources not available in their home markets. The notion of technical adaptation emphasizes the importance of transformation or adaptation for emerging economy SMEs to be congruent with other advanced members and benefit from their global linkages. Our work complements previous research (e.g., Lane and Lubatkin 1998), which suggests partner similarity [i.e., (1) knowledge base or know-what, (2) organizational structure and processes or know-how, and (3) dominant logic or preferences on how the partner applies knowledge or know-why] determines a firm's ability to learn from international partners.

Technical adaptation is thus an important process undertaken by technologically laggard SMEs to enable inter-firm learning in the GVC setting.

Second, this study generates new insights for the literature on interfirm relations. This literature stream centers on two dominant logics—the logic of power and the logic of embeddedness (Casciaro and Piskorski 2005; Gulati and Sytch 2007). Rather than treating these logics as alternative explanations for different dimensions of interdependence, our study, to the best of our knowledge, is among the first to link these two perspectives to understand relationship-specific investment as both a response to power imbalance and an action enhancing relational embeddedness in interfirm relations. By identifying and confirming the moderated mediation relationship, our findings show that interdependence can positively influence interorganizational learning engendered through relationship-specific investments. This study enriches the international management literature, reinforcing that (1) the variation in technical adaptation as a result of GVC dependence is due to the different levels of historical position of the firms, and (2) the variation of the technical adaptation effect on the knowledge transfer benefit toward SMEs results from the different levels of financial slack dedicated to strategic activities that facilitate SMEs' learning. Our work, thus, reinforces the value of the contingency perspective for research on internationalization-performance for firms from emerging markets, as proposed by Banalieva and Sarathy (2011).

Much has been written about the adaptation of foreign firms in GVC to local demand and business practices (Lane and Lubatkin 1998; Saliola and Zanfei 2009). This study enriches GVC research by examining how local SMEs in emerging markets benefit from their interaction with foreign GVC partners. Indeed, our research provides empirical evidence to advance the current understanding of the impact of GVC on the development, particularly knowledge transfer, of SMEs from emerging economies and offers intervening mechanisms (i.e., historical position of the firms in the GVC and financial slack) through the lens of network building (Andersson et al. 2002) and the behavior argument of organization theory (Tan and Peng 2003) to explain the variation in the learning of SMEs in the context of the GVC.

5.2 Strategic Implications

Knowledge acts as a preeminent resource for firms in their quest for global competitiveness (Kedia et al. 2012). To be successful in their internationalization, firms must be able to pursue the best learning approach taking into account their environmental contexts and networks. According to Siggelkow and Levinthal (2003), firms can gain a competitive advantage if their activity configurations are both internally consistent and appropriate to the environment in which they operate. To managers of technologically laggard SMEs from emerging markets, this study has demonstrated the strategic implications of technical adaptation in the GVC context, which is crucial to the quality of SMEs' learning through global linkages with GVC counterparts. Technical adaptation is important in the sense that it enables the linkage between advanced foreign firms and the technologically laggard SMEs within GVC. It further improves the legitimate status of less advanced SMEs, thereby allowing

them to establish working relationships with more advanced members of the GVC and subsequently gain learning benefits. Although a knowledge gap incentivizes emerging economy SMEs to undertake resource linkages with their foreign counterparts, their access to the knowledge resources available is hampered if they do not possess the technical adaptation capability to participate in GVC as insiders or legitimate members. Technical adaptation achieved by firms making necessary adjustments to their product technology, production technology, and overall business in order to generate a congruity between the SMEs themselves and their advanced GVC partners. Such congruity between SMEs and other GVC partners also helps form a context in which SMEs become more capable of understanding their partners and thus they can gain new knowledge more effectively (Darr and Kurtzberg 2000; Lane and Lubatkin 1998). The costs of coordination may also reduce because technical adaptation promotes inter–organizational understanding and exchange of information. Further, technical adaptation provides the foundation for SMEs to seek common solutions to the problems that other GVC partners have also experienced. Therefore, lacking technical adaptation might lead to high knowledge transaction costs (e.g., difficulty in recognizing and understanding knowledge, and more effort and expenses required for decoding of external knowledge). Hence, SMEs' ability to transform or adapt their operations to be congruent with more advanced GVC partners can maximize the magnitude of the learning and knowledge transmitted to them. Ultimately, the continuous adaptation of the firms, in this case their technical adaptation, will contribute to strengthen the flexibility and resilience of the GVC (Kano 2018), thereby strengthening the GVC's market competitiveness.

Consistent with the claim by Argote and Miron-Spektor (2011, p. 1126) noted, "learning begins with experience", we find a stronger historical position in the GVC can amplify technical adaption for the SMEs. A lack of experience can increase the complexity and hinder the ability of the firm to interact successfully in the GVC (Buciuni and Mola 2014). Thus, our study suggests the typical born-global approach (Knight and Cavusgil 2004) may not always be an appropriate strategy, particularly if the SMEs do not possess a sufficient level of historical transactional relationships with their GVC partners. A possible remedy to a lack of historical experience could be to acquire human resources having significant duration exposure to GVC settings. This could subsequently elevate the SMEs' technical adaptation capability within the GVC. Lastly, financial slack facilitates the ability of the firm to deal with unexpected events and risk situations (Andersen 2012). As financial slack can facilitate learning from working relationships with GVC partners, it is important that SMEs allocate financial slack to fuel internal adaptation and/or transformation to facilitate their learning. Accessing and accumulating financial slack through various channels are essential in this process.

Although Southeast Asian countries diverge significantly in their level of industrial development, economies such as Thailand, Vietnam, Indonesia, and the Philippines are similar with regard to their high level of GVC participation. After decades of GVC participation, those countries remain low-cost and labor-intensive production locations for multinational organizations. Catching up and upgrading are therefore common challenges for SMEs in this region (Pietrobelli and Saliola 2008; Saliola and Zanfei 2009). These circumstances make the issue of learning by SMEs

a key concern for policy makers. This study provides important insights, especially for the Southeast Asian region. It highlights that there is a congruity threshold (e.g., adapting and complying with the overall GVC practices and operations) for learning and knowledge transmission to occur within Southeast Asian economies. The general recommendation is that industrial development policies should consider providing support to SMEs to reach a congruity threshold. This may include support for firms to become familiar with and adapt to the practices and standards of networked production systems in GVC, which are arguably distinct from the typical domestic methods of operations. Additionally, developing policies to allow for ease of access to financial resources could facilitate better learning between SMEs and their global partners, which in turn allows greater knowledge transfer benefits into the region.

5.3 Limitations and Future Research Directions

While the findings might be transferable to technologically laggard SMEs within different GVC settings, the study has several limitations that warrant further attention. First, the theorizing in this study was predominantly drawn from the logic of power and logic of embeddedness, aided by network building and the behavior argument of organization theory. Other theoretical approaches (e.g., dynamic capability theory) may generate interesting hypotheses that could be tested. Second, although this study used multiple respondents and actual data when possible, the research was limited in that several variables were obtained in self-reported form, drawing from the perspective of two firm executives. Although we have endeavored to minimize CMV, we cannot entirely rule out the limitations of self-reported data. Nevertheless, in measuring the key variables such as technical adaptation, we argue this particular variable is better suited for evaluation by firm executives, who are insiders with intimate knowledge of the transformation processes of the firm's product technology, production technology, and overall business conduct, compared to the utilization of certain crude archival proxies. In addition, some of the variables in our study were based on retrospective data (e.g., asking participants to refer to the period of 2011–2012 and 2013–2014) when the respondents answered the survey questions. Further, we did not obtain data in dyads (from both emerging economy SMEs and international partners) and collected cross-sectional data in one market only (i.e., Thai SMEs participating in GVC). Hence, future research might extend this work to other emerging economies or test it within a particular industry or institutional context.

Overall, this study enriches the contemporary discussion about the learning of SMEs in the GVC setting, where the logic of power and logic of embeddedness play an essential role in knowledge transfer. This current research has offered a new perspective for future scholarly pursuits that focus on the catching up of technologically laggard SMEs in different GVC contexts. In addition, learner SMEs in GVC may develop further network embeddedness in different ways that have not been considered here. Future research addressing the impact of linkages on knowledge transfer benefits by using alternative theoretical constructs has the potential to advance knowledge about GVC.

Scholars might also consider the diminishing return of technical adaptation. One might expect that, significant relationship-specific investments by technologically laggard SMEs to pursue technical adaptation could become too costly for their learning. In such circumstances, it would be valuable to examine whether technical adaptation still provides benefits in terms of knowledge transfer toward them. If this is the case, would SMEs rely less on adaptation and instead invest in riskier activities (e.g., conduct their own R&D) in the long term? What is the optimum level of technical adaptation versus SMEs' own R&D efforts? Will the partners perceive that there is a level above which congruent knowledge and practices are harmful?

Further, the degree of technical adaptation could be considered in its interaction with other industry environmental factors. For instance, one might expect that, compared with highly dynamic industries, SMEs enjoying high profit may not want to adapt or change in accordance with their GVC partners. Finally, given the importance of congruity threshold, the questions related to the knowledge congruity between foreign firms and SMEs could add additional insights to our understanding of the learning conditions within GVC.

Appendix: Procedural and Statistical Remedies for CMV

Remedies and rationales	Implementation
Procedural	
Protecting respondent anonymity	We guaranteed *complete anonymity* to all respondents and urged them to answer each question as honesty as possible because the results will only be presented in aggregate form; third parties will not be able to identify respondent who participated in this survey. We expected that respondent anonymity minimizes survey participants' tendency to make socially desirable responses when giving their responses
Reducing item ambiguity	Item ambiguity was minimized by keeping questionnaire items straightforward, avoiding vague concepts and double-barreled questions. These techniques are expected to establish *distinctive content* for items measuring all variables. Additionally, all questionnaire items and wordings were *pretested* and carefully considered and validated by business executive and strategic management scholars. Thus, ambiguous words were replaced prior to survey distribution
Separating scale items	We placed measurement items for 1) GVC dependence and 2) knowledge transfer on *different pages* to reduce the likelihood that respondents guess the relationship between focal variables in this study and may consciously match their responses between independent and dependent variable

Remedies and rationales	Implementation
Data from different respondents	We obtained data from *two respondents* in each organization. Top managers (Respondent 1) were asked to respond to question set 1 containing items measuring GVC dependence, knowledge transfer, moderators and several control variables, while senior managers responsible for operations and technology (Respondent 2) were asked to respond to items measuring mediation variable (i.e., network embeddedness). We expected that using two respondents helps control single-informant bias
Statistical	
Partial correlation adjustment	Historical position was used as *marker variable*, as it has the smallest positive correlations with other focal variables. All significant zero-order correlations remained significant after the partial correlation adjustment, indicating that common method bias was not a serious issue in this data set
Harman's one-factor test	A *single-factor procedure test* was performed to test potential common method bias. An unrotated principal components factor analysis revealed four factors with eigenvalues greater than 1.0, which together accounted for 75.89% of the total variance. Also, the first (largest) factor did not account for a majority of the variance (40.06%)
Significance of the interaction terms	Our *interaction terms are significant*. This result is unlikely to be driven by individual rater's bias as it is implausible that individuals' cognitive map will consciously theorize moderated mediation relationships when responding questionnaires, signifying a low chance for common method variance effects

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