

Learning and Upgrading of Craft Exporters at the Interface of Global Value Chains and Innovation Systems

Jan Fransen¹ · Peter Knorringa²

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Abstract Firms operating at the interface of global value chains (GVCs) and innovation systems (ISs) are expected to have better access to knowledge than their competitors, enabling them to learn at a faster pace. This article assesses if and how learning at the interface enables handicraft exporters in emerging economies to upgrade and deepen their capacities. Our conclusion from the analysis of three case studies is that craft exporters incrementally deepen their capacities, but only rarely upgrade. Quasi-hierarchical GVCs in combination with immature ISs are likely to lead to the selective deepening of capacities related to production processes, whereas relational GVC in combination with mature ISs may instead lead to the selective deepening of capacities related to products. The research findings also suggest that GVCs and ISs co-evolve in path-dependent processes. As a result, long periods of incrementally deepening the firms' capacities are intertwined with occasional spurts of discrete upgrading.

Résumé On attend des entreprises qui assurent l'interface avec les chaînes de valeur mondiales (CVM) et les systèmes d'innovation (SI) qu'elles aient un meilleur accès à la connaissance que leurs concurrents, ce qui leur permet ainsi d'apprendre plus rapidement. Cet article évalue si et comment l'apprentissage grâce à ce contact permet aux exportateurs d'artisanat des économies émergentes de se mettre à niveau et d'approfondir leurs capacités. L'analyse de trois études de cas nous a permis de conclure que les exportateurs de produits artisanaux approfondissaient progres-

✉ Jan Fransen
Fransen@ihs.nl

Peter Knorringa
Knorringa@iss.nl

¹ IHS, Erasmus University Rotterdam, Rotterdam, The Netherlands

² ISS, Erasmus University Rotterdam, Den Haag, The Netherlands



sivement leurs capacités, mais ne les mettaient que rarement à niveau. Les CVM quasi-hiérarchiques combinées avec des systèmes d'innovation immatures risquent d'entraîner un approfondissement sélectif des capacités liées aux processus de production, tandis que les CVM relationnelles associées à des systèmes d'innovation matures peuvent conduire à un approfondissement sélectif des capacités liées aux produits. Les résultats de la recherche suggèrent également que les CVM et les SI co-évoluent selon des processus bien balisés. En conséquence, les longues périodes d'approfondissement progressif des capacités des entreprises sont étroitement liées à de soudaines mises à niveau occasionnelles et discrètes.

Keywords Learning · Innovation · Upgrading · Technological capacities · Absorptive capacity · Emerging economies

Introduction

Learning is at the core of local economic development, because it enables firms and local economies to become more competitive (Morrison et al. 2008). Global value chain (GVC) scholars assume that firms in emerging economies learn by absorbing knowledge from GVCs, which are likely to offer local firms access to an advanced pool of global knowledge (Gereffi et al. 2005). Other scholars argue that absorption of knowledge from GVCs is not automatic, but shaped by the nature of the innovation systems (IS) within which firms participate (Fransen and Helmsing 2017; Pietrobelli and Rabelotti 2011). A well-functioning IS is likely to ease the absorption of global knowledge by more widely diffusing global knowledge and/or by enabling local firms to create novel combinations of global and local knowledge (Asheim and Isaksen 2002; Chaminade and Vang 2008; Giuliani et al. 2017). Access to tacit global and local knowledge enables firms to learn at a faster pace than firms outside the GVC/IS interface (Lema et al. 2018).

We aim to better understand the effects of learning at the GVC/IS interface on 'upgrading' (Gereffi 1999) and the 'deepening of technological capabilities' (Morrison et al. 2008). Upgrading is one of the core concepts of the GVC literature and entails that firms make more sophisticated products, make them more efficiently, or move into more skilled activities (Kaplinsky 2000). Learning may enable firms to upgrade within GVCs, but this process is far from straightforward. Humphrey and Schmitz (2002) argue that asymmetries in GVCs may impede upgrading processes of local suppliers. For instance, local suppliers may depend on the brands, designs and marketing of global buyers within so-called quasi-hierarchical GVCs (Gereffi et al. 2005). In such GVCs, global buyers may want to retain these relatively profitable activities and block upgrading processes of local firms (Schmitz and Knorringa 2000).

In this article, we argue that discrete upgrading in GVCs is actually quite rare. As argued by the literature on technological capabilities, local suppliers are more likely to regularly and incrementally deepen their capacities (Lall 2003; Morrison et al. 2008; Teece 2007). As opposed to upgrading 'vertically' in GVCs, firms can



increase their existing knowledge and skill bases, which strengthens their competitiveness within their present GVC and enables them to move 'horizontally' to parallel market segments (Morrison et al. 2008). In fragmented markets, the deepening of capacities enables firms to quickly introduce new products and to service multiple market segments, without moving up the GVC.

The article raises two research questions: (1) What is the impact of existing GVC/IS interfaces on the deepening of capacities of exported handicrafts in emerging economies? And (2) how do learning mechanisms enable exporting crafters to upgrade/deepen within a specific GVC/IS interface? We have studied handicraft exporters in Cape Town (South Africa), Yiwu (China) and Yogyakarta (Indonesia). Handicrafts are defined as small, decorative, cultural items for in and around the house, such as pottery, masks, sculptures, silverware, baskets, small furniture and statues. The handicraft sector is understudied, but is interesting for at least three reasons. First, it is an international growth industry with an annual turnover of over US\$35 billion and a major employment generator. It is one of the few sectors in which emerging economies take the lead (UNCTAD 2010). Second, craft exporters are likely to operate in relatively mature localised ISs, because handicrafts benefit from culturally-embedded designs and craftsmanship. Such relatively mature ISs may enable craft exporters in emerging economies to benefit from the growing global demand for ethnic, natural designs (Perez 2015; Sunley et al. 2008). Third, the interlinkages between GVC and IS learning mechanisms are relatively easily identifiable because of the relatively low levels of technological complexity in the handicraft sector. The selected cases are cities of a similar size (1 million residents) which are hubs in handicraft exports at different stages of GVCs and ISs: Cape Town has a relational GVCs and a mature IS; Yiwu is a quasi-hierarchical GVC and an immature IS; while Yogyakarta has a dynamic handicraft sector with relational GVCs and a maturing IS.

Our main contribution to the academic debate lies in showing how learning leads to the deepening of capabilities, as foregrounded in the technological capabilities approach, and to upgrading, one of the key concepts from the GVC literature. For the craft sector, we find that relatively stable GVC/IS interfaces within the three case studies condition firms to deepen their existing capacities, with sporadic and discrete periods of industrial up- or downgrading.

The article is structured as follows. We first briefly review the GVC and IS literature with a focus on learning at their interface. We subsequently describe the research methods and main findings, after which we relate our findings to the literature and draw conclusions and recommendations.

Literature Review

This section describes the current state of the literature, arguing that different GVCs in combination with different maturity levels of ISs are likely to offer different learning opportunities. We subsequently add upgrading and the deepening of capacities to the equation, and conclude the section by proposing a model linking GVC-IS interfaces to learning, the deepening of capacities and upgrading.



Learning at the Interface of GVCs and ISs

Low-tech industries in emerging countries require access to the latest market information in order to operate in volatile and fragmented global markets. This includes sector-specific information on market trends, designs, brands, international standards, export regulations and outlet opportunities. Being far from clients in developed economies, market knowledge is hard to come by. Buyer-driven GVCs, within which global buyers provide market-oriented knowledge and support, create opportunities to operate and learn in global markets (Gereffi 1999; Gereffi et al. 2005).

For a creative industrial sector such as handicrafts, access to local knowledge is as important as access to knowledge on global markets. An IS enables local knowledge exchange and learning at low transaction costs (Lundvall 2007). Crafters are likely to benefit from tacit knowledge on cultural design and craftsmanship, and from knowledge-intensive business development services. Tacit knowledge is likely to be embedded in informal organisational structures and social networks. It accumulates via experimentation and learning-by-doing (Bhaduri and Kumar 2011; Smith et al. 2014). Local learning on craft designs and production methods is incremental: it is a process of marginal and continuous adjustments to products, production processes, organisational structures and marketing instruments (Fagerberg 2005). This knowledge is not codified, nor scientifically validated, but is experiential and tacit (Gigerenzer 2008). Having access to tacit knowledge requires ties of trust within local craft communities. Within a locality, support organisations such as business associations and chambers of commerce may offer knowledge on market trends, technologies, international standards and export regulations (Asheim et al. 2009; Lundvall et al. 2011).

Partaking in GVCs and ISs offers low-tech firms in emerging economies access to knowledge, but learning opportunities are far from automatic. Local firms can be faced with at least two challenges: power asymmetries in GVCs and immature ISs. Power asymmetries in GVCs relate to differences in firm-level competences. When local firms have limited competences, they are more likely to operate in quasi-hierarchical GVCs, within which local suppliers are likely to depend on the orders, designs, brands and markets of global buyers (Gereffi et al. 2005; Kaplinsky and Morris 2001). As local suppliers produce but do not brand, design or market, their learning is likely to be skewed towards production processes. When firms have more competences and are able to offer their own design and/or unique skillsets, suppliers are no longer interchangeable and have relative bargaining power and room to manoeuvre vis-a-vis global buyers (Humphrey and Schmitz 2002; Schmitz and Knorringa 2000). However, traders may mediate between global buyers and local suppliers. Traders tend to be more capacitated and maintain direct contact with global buyers. They may therefore also have power asymmetries with local suppliers (Crisuolo and Narula 2008; Saliola and Zanfei 2009).

The second challenge is immaturity of the IS, which entails that local knowledge exchange and knowledge-intensive business development support are relatively rare or are not functioning properly. An IS is emerging when these start playing a more prominent role (Chaminade and Vang 2008). Firms with a relatively high level of competences can in the first instance acquire knowledge from GVCs and diffuse



these within the IS. These firms are called technological gatekeepers (Chiarvesio et al. 2010; Giuliani 2011). Knowledge from global value chains may diffuse down the value chain and spill over to other local firms (Belussi and Sedita 2012; Giuliani 2011).

Learning opportunities and mechanisms of firms in emerging economies are therefore likely to depend on power asymmetries within GVCs and on the maturity of ISs. Pietrobelli and Rabellotti (2011) anticipate that (quasi-) hierarchical GVCs are likely to coincide with immature ISs. Local suppliers are likely to learn via deliberate knowledge transfer from the lead firm on a limited number of tasks, especially related to production processes (Pietrobelli and Rabellotti 2011). Since the GVC is the main channel of learning, the role of the IS is limited. Firms may also learn at the firm level in internal R&D efforts, by hiring skilled workers, or via joint equity arrangements, and/or they may learn from their suppliers (Giuliani et al. 2017). In contrast, a relational GVC is more likely to coincide with a mature IS. Firms are likely to learn from face-to-face interactions within GVCs and the IS. In an ideal-case scenario, these interactions take place in an environment of trust and reciprocity. In reality, power asymmetries within GVCs, local value chains and ISs as well as institutional gaps may reduce learning opportunities, especially for less capacitated suppliers. Firms may instead also learn within their firm, by imitating competitors and/or by operating in local or regional value chains (Giuliani et al. 2017; Lee et al. 2017).

Upgrading and the Deepening of Capacities

The literature on learning within GVCs and ISs has paid limited attention to upgrading and the deepening of capacities. This is a missed opportunity, because it is worthwhile to consider if and how learning enables firms to deepen or upgrade their capacities.

Upgrading is a core concept of GVC literature, arguing that GVCs offer opportunities for local producers, regions or countries to move ‘up the GVC ladder’ (Humphrey and Schmitz 2002; Pietrobelli and Staritz 2017). Humphrey and Schmitz (2002) classify upgrading processes into three types: process upgrading, which entails moving to more efficient production systems; product upgrading, which entails moving into higher value product lines; and functional upgrading, which entails acquiring new functions. In a seminal article, Gereffi (1999) analyses how local suppliers in developing countries move from the mere assembly of goods to original equipment manufacturing and original brand manufacturing. Lee et al. (2017) show that local firms may first learn and upgrade in GVCs, after which they may move to local value chains in order to functionally upgrade, and then move back to GVCs. While these perspectives of upgrading in GVCs are rather positive, other scholars are more sceptical. They argue that power asymmetries may inhibit upgrading within the GVC, enabling certain types of upgrading but disabling others (Gereffi et al. 2005; Humphrey and Schmitz 2002). Humphrey and Schmitz (2002) also argue that upgrading is primarily significant for firms new to global markets, as they are faced with new products, international standards, and scales of production and



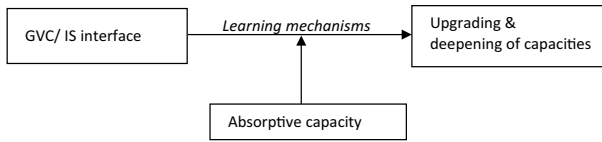


Fig. 1 Conceptual framework. *Source* Own elaboration.

functions. However, when local suppliers have been exporting for a longer period of time, upgrading and especially functional upgrading becomes rare (Giuliani et al. 2017).

Upgrading is a powerful concept, which adds an evolutionary perspective to GVC analysis, but it also has its drawbacks. First of all, the concept is rather fuzzy (Morrison et al. 2008). If we assume a local firm which introduces a new product with a similar value added in order to enter a new market segment, then we may question whether this is a form of product upgrading or not. Some scholars would say yes and operationalise upgrading as innovation, but others do not (Morrison et al. 2008). We define upgrading in a more limited way. In particular, we define it as the ability of firms to increase the value added of its products and processes (Giuliani et al. 2017; Morrison et al. 2008). Local suppliers not only aim to upgrade ‘vertically’ to more value added products and processes within the GVC but may also deepen their capacities ‘horizontally’ to parallel markets and related products or services. Firms may introduce new products or services of similar value added, and/or adjust production lines in order to service different market segments more flexibly. In the process, they deepen capabilities without moving up the GVC ladder (Morrison et al. 2008).

The concept of deepening of capabilities is drawn from the Technological Change perspective, which discusses how firms learn specific technological capacities. While a GVC perspective assumes that power asymmetries in GVCs impact on learning and upgrading, the technological change perspective attaches greater value to firm-specific learning strategies and capacities (Lall 2003; Morrison et al. 2008). It identifies different firm-level capabilities, including productive capabilities, which is a routine capability required to produce to specification (Chaminade and Vang 2008; Dutrénit 2004). Firms also need dynamic capacities to learn and innovate (Tece 2007). Absorptive capacities enable firms to acquire knowledge, assimilate it, combine it with prior knowledge and realise organisational change and innovation (Cohen and Levinthal 1990; Dutrénit 2004; Zahra and George 2002).

We aim to better understand if and how GVCs and ISs enable exporting firms to deepen their capabilities and/or upgrade at the interface of GVCs and ISs. Scholars link these concepts, but leave open how and when learning mechanisms lead to the deepening of capabilities and/or upgrading (Giuliani et al. 2017; Pietrobelli and Rabellotti 2011). As a result, the evolutionary patterns remain somewhat blurred. We study the interlinkages based on the research framework in Fig. 1. It assumes that specific GVC governance coincides with a specific maturity of ISs. Based on the literature, we would expect combinations of quasi-hierarchical GVCs and immature ISs on the one hand and a relational GVC with a mature IS on the other (Pietrobelli



Table 1 Number of respondents. *Source* Authors

	Survey (firms)	Semi-structured interviews
Yiwu, China	119	19
Yogyakarta, Indonesia	100	41
Cape Town, South Africa	83	23
Total	302	83

and Rabellotti 2011). These different interfaces are likely to lead to different types of upgrading and/or deepening of capacities, whereby we expect that quasi-hierarchical GVCs would lead to process upgrading and deepening and relational GVCs to product and process upgrading and deepening of capacities (Gereffi et al. 2005).

Figure 1 also introduces intermediate variables. The first is learning mechanisms, which describe the structural arrangements allowing firms to systemically collect, assimilate, transform and use knowledge (Popper and Lipshitz 1998). Here, we especially draw on learning mechanisms identified by Giuliani et al. (2017) and Pietrobelli and Rabellotti (2011). A second intermediate variable is absorptive capacity, because the firm's ability to learn also depends on its own ability to absorb knowledge (Cohen and Levinthal 1990; Dutrénit 2004; Teece 2007; Zahra and George 2002). We are aware that firms may also acquire knowledge from other sources and/or may opt to upgrade in regional or local value chains (Keijser and Iizuka 2018; Lee et al. 2017).

Research Methods

The study applies a multiple and comparative case study approach with mixed methods. As previously mentioned, the selected cases are cities of a similar size (1 million residents) which are hubs in handicraft exports. We selected cases with contrasting independent variables in a stepwise process. We have first selected Yogyakarta based on prior knowledge of its dynamic handicraft sector with relational GVCs and a maturing IS. Based on a literature review, we subsequently selected Cape Town, with relational GVCs and a mature IS, and Yiwu, with quasi-hierarchical GVCs and an immature IS. The main author collected the data with support of local universities, whereby support and feedback of local partners improved the internal validity of the study results. The case study approach enabled a rich comparative analysis within contexts, but also has its limitations: statistical generalisation is not possible, sample sizes are relatively small, and it is impossible to control for differences in institutional contexts.

Table 1 lists the number of respondents. We conducted a relatively large number of semi-structured interviews to understand the firms' learning and composed a survey of about 100 firms per case study. We drew a random sample by compiling firm databases based on secondary data and semi-structured interviews and added



informal firms not listed through snowball sampling. We visited the firms and interviewed the director or a second in line.

We identify three groups of variables (Table 2). The dependent variables are upgrading and the deepening of the firms' capacities. Upgrading is measured qualitatively as the introduction of sophisticated products, processes and functions leading to more profitable positions in GVCs (Humphrey and Schmitz 2002). The deepening of capacities is indicated quantitatively as the firms' product and process innovations, whereby we argue that the process of innovations leads to the deepening of capacities (Lundvall et al. 2002). We measure product innovation on a scale from 1 'new to the firm or region' to 2 'new to the sector' to 3 'new to the world' (OECD 2005), and process innovation as a dummy variable on whether firms prioritise processes or not.¹

Independent variables are the GVC and IS and their interface is indicated by the case study. The GVC is measured quantitatively by five indicators: the relative importance that local firms attach to knowledge of global buyers; the role of firms in GVCs (trader or supplier); the transactional dependence of local firms on the global buyer; the client's control of designs; and the client's control of brands. The indicators correlate, but they are not aggregated because the Kaiser–Meyer–Olkin (KMO) test for sampling adequacy scores 0.566, while scores below 0.6 indicate the sampling is not adequate. The IS is measured quantitatively by one composite factor and three indicators. The composite factor indicates the perceived importance of knowledge exchange with five non-firm actors and is created in a principal component analysis, excluding cases listwise (KMO=0.795). A higher score indicates stronger interactions with non-firms. Other indicators are the knowledge interactions with local firms, whether or not firms observe other local firms and the training of entrepreneurs. The maturity of the IS is described qualitatively based on the rules of appropriation, business development support, R&D support and financial support.

Intermediate variables are the firms' absorptive capacity and their learning mechanisms. Absorptive capacity measures the competences of low tech craft firms to absorb global scientific and local cultural knowledge (Fransen and Helmsing 2017). These are indicated quantitatively in a factor of seven indicators (see Table 2). The factor is created in a principal component analysis, excluding cases listwise, with a KMO of 0.745. A higher score indicates a higher level of absorptive capacity. The learning mechanisms are indicated qualitatively by the firms' activities to acquire knowledge and translate these into firm-level competences. Finally, we included control variables related to the characteristics of the firm, entrepreneur and market segment.

We analyse the data in four steps, which are reported under the four subheadings of the subsequent section. The first two steps relate to the first research question: What is the impact of existing GVC/IS interfaces on the deepening of capacities of craft exporters? First, we compare the case studies quantitatively and qualitatively, in order to assess if the GVC/IS interfaces, absorptive capacities and the deepening

¹ The reason is that most product innovations also demand process innovations. To shift out this secondary effect, the study asked if firms explicitly prioritise process innovations.



Table 2 Indicators used in the quantitative and qualitative analysis

Variables	Aggregates and indicators	Source	Scale	Key reference
Dependent	Product upgrading Process upgrading ^a Functional upgrading	Interviews		Humphrey and Schmitz (2002)
		Interviews		
Deepening	Product innovation Process innovation	Survey	1–3	OECD (2005)
		Survey	0–1	
Intermediate	Absorptive capacity The factor comprises: Education level entrepreneur ^b Frequency international travel Departmental structure ^c Business planning Balancing innovations Foreign language abilities Financing innovations	Survey	– 2.5 to 1.5	Cohen and Levinthal (1990), Franssen (2016) and Zahra and George (2002)
		Survey	1–7	
		Survey	1–5	
		Survey	1–3	
		Survey	0–1	
		Survey	0–1	
		Survey	0–1	
		Survey	0–1	
		Survey	0–1	
		Survey	0–1	
Learning mechanisms	Activities to acquire and use external knowledge	Interviews		Pietrobelli and Rabellotti (2011)
		Interviews		
Independent	GVC/IS interface	Survey	1–3	Gereffi et al. (2005) and Humphrey and Schmitz (2002)
		Survey	1–5	
GVC	Case ^d Interactions: global buyers Transactional dependence Clients control brand Clients control design Roles (trader/supplier)	Survey	0–1	
		Survey	0–1	
		Survey	0–1	
		Survey	0–1	
		Survey	0–1	



Table 2 (continued)

Variables	Aggregates and indicators	Source	Scale	Key reference
IS	Interactions local firms	Survey	1–5	Asheim and Isakson (2002) and Lundvall et al. (2011)
	Interactions non-firms (factor) ^e	Survey	–9,5 to 3,6	
	Training (entrepreneur last 5 years)	Survey	0–1	
	Observe (other local firms)	Survey	0–1	
	Support systems ^f	Interviews		
	Firm size (employment) ^g	Survey	1–5	
	Firm age	Survey	1–59	
Controls	Firm ownership (foreign; local)	Survey	0–1	Macpherson and Holt (2007)
	Age entrepreneur	Survey	20–96	
	Gender entrepreneur (female/male)	Survey	0–1	
	Market segment ^h	Survey	1–8	

^a / Products are new to the firm or region, 2 products are new to the sector, 3 products are new to the world

^b / Primary level not completed, 2 primary level, 3 secondary level not completed, 4 vocational, 5 professional diploma, 6 university

^c / 0 1 or more departments, 1 Yogyakarta, 2 Cape Town, 3 Yiwu

^d / Yogyakarta, 2 Cape Town, 3 Yiwu

^e / Local non-firms are chamber of commerce, business associations, government, universities and finance institutes

^f / Indicated by rules of appropriation and MSTQ, R&D support, financial support

^g / Staff-size categories: 1 no staff, 2 1–9 staff, 3 10–49 staff, 4 50–499 staff, 5 500 and more

^h / Wood, pottery, stone, paper and plastic, wickerwork, leather, silverware, metal

of capacities differ significantly between the case studies. Second, regression analyses assess the impact of differences in GVCs and ISs on the deepening of the firms' capabilities, moderated by absorptive capacities. Product and process innovation are a categorical and binary variable estimated in ordered probit regressions. Using the same regression method for all models enables a comparison. Appendix 1 offers additional regression models on product and process innovation of (1) dependent variables; (2) dependent and control variables; and (3) dependent variables, control variables and interaction effects. In order to increase the robustness of the findings, we only report on findings which are significant in at least three of the four models. A Chow analysis finds that the regressions on product and process innovation differ between the case studies at 0.01 significance, which reduces the risk of endogeneity (Fransen 2016, p. 189). The last two steps relate to the second research question: How do learning mechanisms enable firms to deepen their capacities and/or upgrade? The third step is a qualitative analysis in Atlas-ti, which shows how institutionalised learning mechanisms lead to the skewed deepening of capacities, as opposed to upgrading. Finally, a qualitative analysis in Atlas-ti identifies discrete moments in place and time within which firms upgrade.

Study Findings

Step 1: Comparison of Case Studies

The section describes and compares case studies. Table 3 compares the three cases quantitatively.

Yiwu, a Chinese city in Zhejiang Province, is one of the largest mass producers of handicrafts in the world and houses the world's largest wholesale market with approximately 58,000 suppliers. It is aptly called China Commodity City. In the early 1980s, Yiwu was one of the first territories in China where the communist party allowed for private entrepreneurship. Between 1980 and 2000, the number of firms working in the emerging local market increased rapidly. By 2000, firms had acquired enough competences to operate in GVCs. Global buyers offered to buy large volumes of products, under the restrictive condition that firms would produce their design and brand. Slowly, a new interface of quasi-hierarchical GVCs with an immature IS emerged.

In the newly emerged interface, Yiwu's craft firms are relatively likely to innovate production processes, but hardly innovate products (Table 3). In doing so, they deepen their process capacities. Compared to their counterparts in Cape Town and Yogyakarta, they attach more importance to knowledge from GVCs, indicating their significantly higher dependence on brands and designs of global buyers (Table 3). While this dependence on designs and brands indicates quasi-hierarchical GVCs, the firms do not depend on sales to one global buyer. In fact, 66% of firms sell to more than 25 global buyers and also sell at Yiwu's wholesale market (Table 4; qualitative data). The IS can be considered as immature. Firms do not benefit from China's extensive innovation policies, because these ignore low-tech industries (Tang and Hussler 2011). Instead, the local business development support, education and



Table 3 Quantitative comparison of the case studies. *Source* Authors analysis

	Mean/median	Min.	Max.	SD	Yiwu	Yogyakarta	Cape Town
Deepening capabilities							
Product innovation	2.5/3	1	3	.8	1.1 _a	1.4 _b	2.0 _c
Process innovation	0.2/0	0	1	.4	.36 _a	.27 _a	.05 _b
Independent/intermediate variables							
Case	2.1/2	1	3	.9	118	100	83
Interactions global buyers	3.8/4	1	5	1.4	4.4 _a	3.4 _b	3.3 _b
Transactional dependence	37/30	1	100	24	31 _a	47 _b	37 _a
Role (share traders)	.1/0	0	1	.4	15 _a	31 _b	7 _a
Clients control brand ^a	.4/0	0	1	.5	0.5 _a	0.3 _b	.0 _c
Clients control design	3.2/3	1	5	1.4	3.7 _a	3.2 _b	2.3 _c
Interactions local firms	2.6/3	1	5	1.3	2.9 _a	2.6 _a	2.0 _b
Interactions non-firms	.0/0	-1.9	13.2	1.0	.1 _a	.2 _a	-.3 _a
Training entrepreneur	.6/1	0	1	.5	.7 _a	.5 _a	.6 _a
Observe	.7/1	0	1	.4	.8 _a	.8 _a	.7 _a
Absorptive capacity factor	.0/.24	-2.4	1.5	1.0	.1 _a	-2.4 _b	1.8 _a
Control variables							
Firm size	142/21	1	15,000	908	324 _a	37 _b	13 _b
Firm age	13/11	1	59	7.9	14	13	11
Firm ownership	.8/1	0	1	.4	.7 _a	.9 _b	1 _b
Age entrepreneur	2.9/3	1	5	.9	45 _a	40 _b	45 _a
Gender entrepreneur	.7/1	0	1	.4	.08 _a	.19 _a	.48 _b
Market segment (median)	4	1	8	2.5	4 _a	7 _b	1 _c
N	302				119	100	83

^{abc}Value in the same row and subtable not sharing the same subscript are significantly different at $p < .05$ in the two-sided test of equality for column proportions. Cells with no subscript are not included in the test. Tests assume equal variances

^aOwn brand includes crafters whom sometimes export in their own brand

training are directed at improving production technologies, with a focus on engineering as opposed to product designing (respondents #4, 42, 61, 66, 132). Quantitative data reveals that firms appreciate meeting local non-firm actors (Table 3). Qualitative data reveals that firms meet non-firm actors primarily to attain access to land, labour, markets and other resources. These ‘quanxi’ networks are hardly ever used for knowledge exchange and innovation (respondents #1, 31, 107, 108, 122, 129, 131; see also Mitussis 2010; Wang and Lin 2013). Knowledge spillover as indicated by the extent to which firms observe each other is comparable to Cape Town and Yogyakarta (Table 3).

Table 3 indicates that the absorptive capacities of firms are similar to those in Cape Town and higher than those in Yogyakarta, whereby robustness analyses show that Yiwu’s firms are especially more likely to have a departmental structure and business plans. This is associated with a larger average firm size enabling mass production (Table 3). Qualitative data reveals that the absorptive capacities differ



Table 4 Ordered probit regression of product innovation. *Source* Authors analysis

	Coefficient	M.E. 1 ^a	M.E.2 ^a	M.E. 3 ^a
Thresholds				
Product innovation 1: low	1.222 (.222)***			
Product innovation 2: medium	1874 (.238)***			
Location				
Case: Yogyakarta	.911 (.271)***	-.259 (.058)***	.118 (.027)***	.141 (.040)***
Case: Cape Town	1.529 (.283)***	-.443 (.063)***	.153 (.030)***	.290 (.051)***
Clients control brand	-.533 (.229)*	.132 (.059)**	-.036 (.019)*	-.096 (.040)**
Absorptive capacity (factor)	.614 (.123)***	-.143 (.025)***	.032 (.008)***	.112 (.022)***
Gender entrepreneur	-4.826 (.282)***	-.041 (.043)	.022 (.013)*	.019 (.036)
Case (Yogyakarta) × gender (female)	4.894 (.457)***			
Case (Cape Town) × gender (female)	4702 (.000)			
Observations	249 ^b			
Pseudo R ² (Nagelkerke)	.440			

Standard errors in parentheses: * $p < .10$, ** $p < .01$, *** $p < .001$

^aMarginal effects of a score 1, 2 and 3 of product innovation

^bDifferences with survey due to missing variables

significantly from the other two case studies. The firms are more likely to have an R&D department, within which engineers study production processes. Firms especially possess absorptive capacities in marketing, production departments and R&D (respondents # 6, 100, 105).

The second case study, Yogyakarta in Indonesia, is home to the Borobudur temple, around which lively craft communities have emerged in surrounding villages (Ismalina 2011). During the 1980s, crafters benefited from growing domestic markets and increasing education and skill levels, but it was seen as a backward sector and was therefore ignored by policy makers (Ismalina 2011; ter Wengel and Rodriquez 2006). This situation changed in the late 1980s, when new industrial policies started supporting local small firms and exports became economically viable due to the depreciation of the Rupiah. In 1990, the trader “Out of Asia” moved from Bali to Yogyakarta, attracted by a combination of artisanal skills, low salaries and new export opportunities. It was led by an Australian designer well aware of western markets. The trading company introduced a shift from traditional to contemporary product designs. Out of Asia worked patiently with the crafters in order to combine materials, change designs and produce these up to international quality standards (respondents #5, 11, 37, 53). The number of traders quickly increased, lured by high profit margins. This has resulted in a relatively large share of traders (Table 3). In the new export markets, firms innovate both products and processes at the intermediate level and as a result slowly deepen their product and process capabilities (Table 3).

Over time, an interface of relational GVCs and a maturing IS has emerged. Due to local knowledge available with the maturing IS, the suppliers attach significantly less



importance to knowledge from global buyers than their counterparts in Yiwu. They are also more likely to sell their own brand and design (Table 3). At first sight, Table 3 does not support the notion that the IS is more mature than the one in Yiwu. However, qualitative data reveals a different reality. Suppliers widely share knowledge within their traditional clusters, as people meet at the mosque, discuss market trends in cluster associations and visit each other socially. This results in a high level of knowledge sharing and spillover (Ismalina 2011). Traders link GVCs to the clustered suppliers (Fransen and Helmsing 2017). Firms have a significantly lower level of absorptive capacities, which hinders innovation (Table 3). A robustness analysis shows that they are especially less likely to have business plans and departments (Table 3). Qualitative data reveal that the entrepreneurs are likely to be designers, able to appreciate the importance of the needed designs and production technologies.

Cape Town is a South African city with a reputed design sector. It was the world capital of design in 2014. Traditionally, the crafters catered for the relatively large South African middle class. This became the sole market for crafters when South Africa was boycotted in response to its apartheid regime. The boycott, in combination with support policies for craft firms in Cape Town, meant that firms could not operate in GVCs and instead experimented with product design, production and marketing themselves. During this time, a dynamic sector of highly educated designers emerged (DACST 1998; DTI 2005).

Once the apartheid regime ended and the international boycotts were lifted, formal firms started exporting again. Crafters in Cape Town are significantly more likely to innovate products and less likely to innovate processes than their counterparts in Yiwu and Yogyakarta (Table 3). They are also more likely to operate in relational GVCs, selling their own brands and designs (Table 3). Qualitative data reveal that the IS is relatively mature. Respondent #58, who is located in one of the clusters in Cape Town, describes intense knowledge interactions among local firms:

We share the floor of this building (...) with three firms. (...) We talk about new ideas. We bounce new ideas. We use the same suppliers, inform each other.

Non-firm actors pro-actively support product innovation. Cape Craft and Design Institute offers a laboratory, meeting places, training, business development services and marketing. Design Indaba organises trade fairs, exhibitions and conferences. The Cape Peninsula University of Technology offers design support. Finally, local government brands Cape Town as an artistic city. The firms are relatively small, with highly educated entrepreneurs willing to take risks (Table 3). Crafting is a way of life, whereby artistic recognition is perceived to be as important as profit (Fransen and Helmsing 2016).

Step 2: Factors Leading to the Deepening of Skills

This section analyses to what extent the above noted differences in GVC, IS and absorptive capacities explain whether firms deepen their product and/or process capabilities (indicated by product and process innovation).



Table 5 Ordered probit regression of process innovation. *Source* Authors analysis

	Coefficient	M.E.
Thresholds		
Process innovation: 0	3.285 (1.042)***	
Location		
Case: Yogyakarta	3971 (1227)***	-.022 (.065)
Cape Town	- 11,981 (14,670)	-.183 (.052)***
Clients control brand	.632 (.306)*	.096 (.042)**
Clients control design	.178 (.106)*	.029 (.017)*
Age entrepreneur	0 ^a	-.0036 (.002)
Firm ownership	.879 (.354)*	.165 (.070)**
Market segment 1: wood	.935 (.566)*	0 ^a
Market segment 2: pottery	1.623 (.609)**	0.120 (0.0796)
Market segment 3: stone	1.637 (.744)*	0.123 (0.120)
Market segment 4: paper/plastic	1.783 (.568)**	0.155 (.072)**
Market segment 5: wickerwork	1.169 (.605)*	0.0346 (0.0686)
Market segment 6: leather	.913 (.703)	-.003 (.076)
Market segment 7: metal/silver	1.870 (.664)**	.174 (.107)
Market segment 8: all	0 ^a	-.078 (.045)*
Case (Yogyakarta) × age entrepreneur	-.070 (.025)**	
Case (Cape Town) × age entrepreneur	.194 (.225)	
Case (Yiwu) × age entrepreneur	.026 (.016)**	
Observations	242 ^b	
Pseudo R ² (Nagelkerke)	.422	

Standard errors in parentheses: * $p < .10$, ** $p < .01$, *** $p < .001$

^aThis parameter is set to zero because it is redundant

^bDifferences with survey due to missing variables

Tables 4 and 5 reveal that territorial differences to a significant degree explain the odds of product and process innovation of firms. Appendix 1 shows that these results are robust. Craft firms in Cape Town and to a lesser extent in Yogyakarta are significantly more likely to innovate products than those in Yiwu. Firms in Cape Town are constantly designing new crafts for the top-end of markets, which they sell to global buyers, galleries, exhibitions and local market outlets. Selective product innovation can be explained by a relational GVC (indicated by a lower likelihood that clients control brands) in combination with a mature or maturing IS focused on product innovation. Other factors that are likely to increase the odds of product innovation are absorptive capacity and gender. Qualitative data furthermore reveal that the entrepreneurs tend to be designers and that global buyers purposefully visit Cape Town or Yogyakarta in search of new design ideas. The designer entrepreneurs are constantly on the look-out for new design ideas and subsequently assimilate these within their firm in order to be able to transform their production processes accordingly. This process deepens their design and marketing capacity, without, however,



moving to higher value added products. Instead, the deepened design and marketing capabilities enable firms to respond flexibly to market volatility and to service parallel markets.

In contrast, the likelihood of process innovation is significantly higher in Yiwu (Table 5). The innovations include adjustments of product lines to new product designs and/or the introduction of new, flexible technologies. The skewedness towards processes can be explained by their partaking in quasi-hierarchical GVCs (indicated by the clients' control of brands), within which local firms specialise in low-cost production. The immature IS is unable to counterbalance the power asymmetries of GVCs. In the innovation process, local firms deepen their capabilities to flexibly produce new craft products at a low cost and up to specification. Capacities to market, brand and design remain underdeveloped. Other factors that are likely to increase process innovations are firm ownership and market segment.

Step 3: Learning Mechanisms Leading to the Deepening of Skills

This subsection shows how learning mechanisms lead to the continuous and incremental deepening of existing capacities as opposed to developing new capacities required to upgrade. Table 6 groups learning mechanisms in accordance with the GVC/IS interface of each case study as well as generic learning mechanisms.

We first discuss Yiwu, which combines quasi-hierarchical GVCs with an immature IS. A variety of learning mechanisms lead to the skewed deepening of process capacities (Table 6). Firms acquire product specifications from their global buyers and subsequently learn by processes of trial and error how to produce these at low cost. Global buyers are unlikely to offer deliberate support, because Chinese suppliers also operate in competing GVCs. Firms therefore instead learn to adjust production processes within their own R&D departments. On a relatively small scale, firms also adjust product designs for sales in the wholesale market, local or regional markets and trade fairs. These parallel market outlets offer additional learning mechanisms, since firms meet buyers face-to-face, experiment with adjusted designs and marketing strategies, observe and imitate what others are doing and source for qualified staff (respondents #3, 22, 32, 91). The additional market channels and learning mechanisms broaden the scope of firms to deepen their capacities and upgrade.

The second interface is that of relational GVCs and a mature IS as found in Cape Town. This leads to the skewed deepening of product capacities. Firms learn-by-doing in global and local value chains, within which they sell small quantities at high prices. Buyers purposefully visit Cape Town in search of new product designs and discuss market trends and design ideas with suppliers. As discussed earlier, the IS is also skewed towards product innovation, as are the firms' absorptive capacities. Firms also learn in internal R&D processes, with a focus on product design. Once crafters have developed new designs and found customers, they instruct their staff on the required production processes and quality standards. The craft firms hardly create advantages of scale, as the production capacities are low.

The third interface is that of relational GVCs and a maturing IS, as found in Yogyakarta. It leads to a deepening of product and process capabilities. Qualitative



Table 6 Learning mechanisms. *Source* Authors analysis

GVC governance (case study)		Deepened capacities		Learning mechanisms		Processes	
IS	IS	Immature	Processes	Communication channel	Processes		
Quasi-hierarchical (Yiwu)	Immature	Processes		GVC Wholesale market/local value chain Within firms	Learn processes by doing Knowledge spillovers; copying; imitation; meet buyers face-to-face R&D on processes		
Relational (Cape Town)	Mature	Products		GVC Communities of Practice Local value chain Within firms	Learn products by doing; face-to-face meetings Share design ideas; co-create Learn products by doing R&D on products		
Relational (Yogyakarta)	Maturing	Products and processes		GVCs IS Communities of Practice Within firms	Learn products and processes by doing Co-create; Intergenerational transfer Share design ideas; co-create R&D on products and processes		
All interfaces (all cases)				GVC LVCs IS/trade fairs Within firms Internet	Meet buyers face-to-face; try out new functions Education, training, sharing codified knowledge; copying; imitation; face-to-face knowledge exchange; new staff Learn-by-doing/communication Google		



data reveal that traders and suppliers use different learning mechanisms, which supplement each other. The main learning mechanisms of traders are to meet global buyers face-to-face, learn-by-doing in GVCs and to Google. GVCs enable traders to learn about the latest product designs in western markets, new market opportunities, new prices and new technologies. Within the IS, traders also learn new product designs in local Communities of Practice, such as KREO, a group of designers who have won many design prizes in Indonesia. Sometimes, new products require considerable R&D of the traders, especially when new combinations of materials may demand new production methods. The traders subsequently co-create new products and production methods with local suppliers, combining global knowledge on market trends, contemporary designs and technologies with the knowledge and skills of local crafters. The suppliers, whose entrepreneurs are lower educated and whose firms are smaller and less capacitated, learn new skills, designs and techniques by co-creating new designs with traders. During this process of learning-by-doing, the trader regularly offers support, coaching, training and quality control (respondents #3, 5, 7, 21, 22, 23). Traders thus function as technological gatekeepers (Giuliani 2011). At the same time, intergenerational knowledge transfer, knowledge networks and knowledge spillovers within traditional clusters ensure that the body of local knowledge and skills accumulates.

The analysis also reveals a large number of learning mechanisms that are available in all GVCs and ISs. Within all GVCs, firms are likely to learn-by-doing and by meeting global buyers face-to-face, in Skype calls or email communication. All three ISs, including the immature IS of Yiwu, offer learning mechanisms that enable firms to operate in GVCs. They offer education, training, information on standards, export regulations and markets, opportunities for face-to-face knowledge exchange, access to qualified staff and knowledge spill-over. In addition, some crafters experiment with new functions such as branding and product design in booming markets of emerging economies (Lee et al. 2017; Lema et al. 2015). Trade fairs offer learning mechanisms to all firms as well, by enabling firms to observe trends and meet buyers face-to-face (Bathelt and Schuldt 2008).

Step 4: Identifying Discrete Moments of Upgrading

The previous sections show that the craft exporters in the three case studies incrementally deepen their capacities, but do not learn new capacities which would allow them to upgrade. A qualitative analysis in Atlas-ti reveals that firms upgrading is concentrated in four discrete moments of place and time since the 1980s.

The first discrete moment is Yiwu in the early 1980s, when the end of communism gradually created new opportunities for private enterprise. Yiwu was among the first Chinese cities allowing private family firms. As China was in great need of low-cost, low-tech commodities, including functional crafts, the number and size of firms grew rapidly. Firms were not yet allowed to trade outside their own region, resulting in the spontaneous emergence of a local commodity market for low-tech products (Forste 2000). The new firms quickly upgraded their functions, products and processes. They developed an impressive range of products, production systems



and marketing systems. At the start, the IS was very immature. Institutions in support of private enterprise and trade slowly emerged, if and when the need for rules became evident (GaoHua 2000; Yueh 2013). Once firms had upgraded, they continued to deepen their capabilities during the latter part of the 1980s and 1990s. They diversified to other products and continued process upgrading on a low scale in order to improve product quality, update technologies and diversify markets (Ding 2012). They were repeating the same trick in diverse markets in order to service the huge market for low-priced commodities in China. In retrospect, we can conclude that firms incrementally deepened their capacities by operating in the local market, until the moment that their capacity met the threshold of international markets.

In Yiwu, a second moment of up- and downgrading took place around the year 2000. Global buyers started noticing the deepened capacities of Yiwu's firms and slowly but surely integrated Yiwu's firms into their GVCs (Bellandi and Lombardi 2012). This set two processes in motion. First, firms upgraded their production processes in terms of increased efficiency, quality improvements and moving to scale. Second, it led to a period of industrial downgrading by retrenching designers. The local firms stopped branding, designing and marketing, because global buyers already offered these functions (respondents #1, #25, #31, #68, #95). In the Yunhe cluster of wooden decorations and toys, for instance, respondent #31 explains:

In the past, we produced our traditional design of wooden blocks. From 2000 onwards, big clients started to look for suppliers. Then, we only had to offer quality and improve delivery time. We no longer designed products ourselves and many designers left.

Firms in Yogyakarta upgraded around the year 1990, when the trading company Out of Asia moved to Yogyakarta and export started in earnest (see the subsection 'Comparison of case studies'). Being the first trading company which targeted the global market of handicrafts, it had an immense impact on the sector. Products were upgraded in order to become contemporary, production processes were upgraded and traders introduced new functions such as international marketing, R&D and subcontracting to local suppliers (local value chain management) (respondents #5, #11, #37, #53).

A fourth discrete period of upgrading started in all three case studies when the financial crises reduced demand from developed economies while demand from emerging markets continued to grow. We find that about seven percent of Yiwu's firms upgraded their products and functions in order to sell higher quality products to the emerging local middle class (respondents #104, 105, 125, 129). They upgraded to own brand manufacturing. In Cape Town and Yogyakarta, firms also upgraded by pioneering brands and designs in local and regional markets.

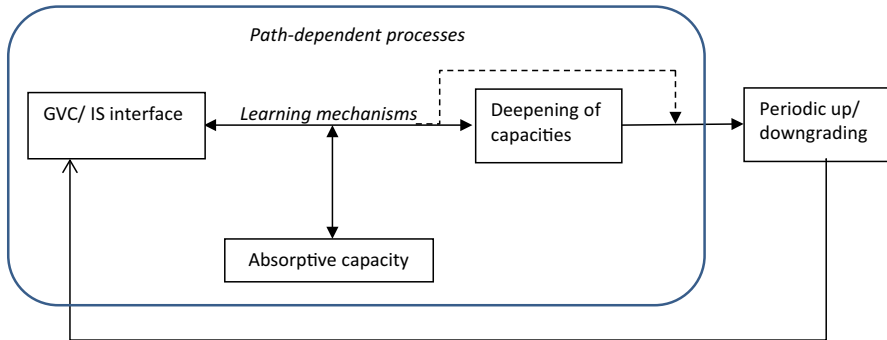
Discussion

This section relates the empirical findings to the academic debate. Our findings confirm Pietrobelli and Rabellotti's (2011) dynamic learning model. In particular, the findings confirm that different GVC/IS interfaces are likely to deepen different and



Table 7 GVC/IS interfaces and deepening of capacities in craft exports. *Source* Authors

Case study	GVC governance	IS	Deepening of capacities
Yiwu	Quasi-hierarchical	Immature	Process capacities
Cape Town	Relational	Mature	Product capacities
Yogyakarta	Relational	Maturing	Product and process capacities

**Fig. 2** Co-evolutionary processes leading to upgrading in handicrafts. *Source* Own elaboration

selective capacities of firms. The previous section has shown quantitatively which factors deepen product and/or process capacities and qualitatively how learning mechanisms mediate these processes. Table 7 summarises the three different GVC/IS interfaces and their effects on deepened capacities. Our findings also confirm that firms may opt to move to local and regional value chains, within which they can upgrade products, processes and functions (Lee et al. 2017).

Our main contribution to the academic debate lies in showing when and how learning leads to deepened capacities and upgrading. The research findings show that craft exporters incrementally deepen their capacities, while they only sporadically engage in discrete upgrading. In line with Morrison et al. (2008), we find that learning does not necessarily lead to upgrading, but is instead more likely to deepen existing capacities of firms. In Yogyakarta and Cape Town, crafters continuously deepen product capabilities, but they do not regularly introduce sophisticated products with a higher value added. In contrast, craft exporters in Yiwu constantly deepen their capacity to produce a large number of products flexibly, but they hardly ever increase production efficiency.

Based on our findings, we pose the following co-evolutionary process for handicrafts in emerging economies (Fig. 2). We find that the GVC/IS interface does not change rapidly, but instead behaves path-dependently, changing slowly and incrementally. In our case studies, we find only four moments of up- and downgrading in three territories in a period of about 40 years. This line of reasoning resonates with the literature on economic evolutions and in particular path dependence (Arthur 1994; Martin and Simmie 2008; Martin and Sunley 2006). These relatively stable institutional regimes (i.e. the GVC/IS interface) condition the content of knowledge



available to firms and the firms' learning mechanisms (Pietrobelli and Rabellotti 2011). The learning mechanisms are also influenced by the firms' absorptive capacity, since firms need to be able to appreciate the relevance of new knowledge and put it to use (Zahra and George 2002). When firms learn, their capacities deepen in path-dependent processes (Dutrénit 2004; Morrison et al. 2008), whereby strong capacities may be strengthened and weak ones ignored. In other words: the GVC, IS, firms' absorptive capacity and their learning mechanisms are rather stable, co-evolving in path-dependent processes, leading to the incremental deepening of specific capabilities.

Our research has found that long periods of deepening the firms' capacities are intertwined with sporadic periods of industrial up- or downgrading. We find only one reason why craft exporters take the exceptional risk to up- or downgrade: when they enter new value chains. Our study identified four moments of upgrading: firms in Yiwu started producing locally; firms in Yiwu and Yogyakarta started exporting; and craft exporters started exploring local and regional markets in response to the global financial crises. Our findings show that craft exporters upgrade in order to meet international standards and downgrade when power asymmetries of quasi-hierarchical GVCs force local firms to let go of branding, design, marketing and/or value chain management. Other scholars report on similar processes of industrial downgrading (Kaplinsky and Morris 2001; Meyer-Stamer 2004).

Conclusion

Exporting firms operating in both GVCs and ISs are likely to have better and faster access to knowledge than those outside this interface. They are also likely to have more learning mechanisms at their disposal, as they can acquire knowledge from GVCs and ISs. Learning at this interface is therefore likely to offer exporting firms an opportunity to innovate and learn at a faster pace than competitors. This is likely to offer them a head start in highly competitive global markets, but only if firms deepen their capacities and/or upgrade in GVCs.

Pietrobelli and Rabellotti (2011) have shown how GVCs and ISs are likely to coincide, leading to specific learning mechanisms. Our study results confirm this finding. In this article, we have aimed to enrich the academic debate by analysing the effects of learning at the GVC/IS interface on upgrading (Humphrey and Schmitz 2002) and the deepening of capacities (Morrison et al. 2008). We conduct an empirical study of handicraft exporters in emerging economies, with two research questions: What is the impact of GVC/IS interfaces on the deepening of capacities of handicraft exporters in emerging economies? And how do learning mechanisms enable firms to upgrade and deepen their capacities? Data were collected in three case studies in emerging economies. While we aim for theoretical generalisation, the research findings should be taken with care due to the limited scope of the study.

In line with Morrison et al. (2008), our first conclusion is that firms in emerging economies are likely to incrementally deepen their capacities. This enables firms to flexibly respond to market volatility and to reap opportunities in parallel markets. We find that upgrading within GVCs is relatively rare. In our case studies, firms



primarily upgrade if they enter into new value chains, be it local, regional or global. While it is of crucial importance to understand such relatively radical change, the incremental and less visible process of deepening capabilities deserves more academic attention.

Our second conclusion is that firms institutionalise and standardise their learning mechanisms within their specific GVC/IS interface. In combination with relatively stable GVC/IS interfaces and capacities of firms, this is likely to lead to path-dependent processes, within which strong capacities of firms are incrementally strengthened and weak capacities may be ignored as alternative pathways are forgotten (Martin and Sunley 2006).

Finally, we conclude that GVCs, ISs, the firm's capacities and learning mechanisms co-evolve in processes that are non-linear, non-deterministic and largely self-organised. There is an incremental build-up of potentially selected capacities and a continuous incremental change, which—in combination with shocks such as new technologies—will now and then lead to spurts of discrete upgrading of handicraft firms in specific locations.

We recommend additional longitudinal research to better understand the co-evolutionary processes leading to the deepening of capacities and upgrading. As the processes are sector-specific, we recommend empirical studies in other sectors and territories, systematically including the concept 'deepening of capacities' and questioning under what conditions firms upgrade. Longitudinal studies should preferably consider periods of 50 years or more, in order to appreciate the evolutionary processes. While our study benefited from longitudinal qualitative data, the addition of quantitative panel data may further enrich future analyses.

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Appendix 1

The appendix offers additional regression models on product and process innovation.

Table 8 shows ordered probit regressions on product innovation in a step-wise manner. For the sake of robustness, we run four models: (1) a model with only the independent variables; (2) a model with independent and control variables, (3) a model with independent variables, control variables and interaction effects and (4) a model with significant factors only. The fourth model is shown in the main text, which also reports on marginal effects. In order to ensure robust results, we only report on factors which are significant in at least three of the models. To further the robustness of the findings, we run the model with different reference



Table 8 Probit regression on product innovation

	Model 1 Independent variables	Model 2 Independent and control variables	Model 3 Variables and interaction effects
Thresholds			
Product innovation: low	2.836 .882)***	3.078 (1.415)*	13.183 (3.381)***
Product innovation: medium	3.521 .894)***	3.795 (1.424)**	12.250 (3.356)***
Locations			
Case: Yogyakarta	1.162 .337)***	1.059 (.432)**	11.381 (3.933)**
Case: Cape Town	1.615 .360)***	2.072 (.647)***	10.156 (3.164)***
Interactions global buyers	– .129 .093	– .113 (.110)	– .171 (.134)
Transactional dependence	– .440 .458	.818 (.640)	0 ^a
Clients control brand	– .761 .300)**	– .851 (.371)*	– 2.165 (.699)**
Clients control design	.130 .094	.176 (.111)	– 1.481 (1.017)
Roles	– .043 .298	.217 (.387)	0 ^a
Interaction local firms	.156 .096)*	.183 (.116)	.235 (.143)*
Interaction non-firms	– .093 .121	– .155 (.143)	– .189 (.221)
Training	– .139 .258	– .183 (.298)	– .986 (.458)
Observe	– .017 .065	– .078 (.093)	.156 (.076)
Absorptive capacity factor	.773 .166)***	.855 (.213)***	1.536 (1.168)
Firm size		.076 (.236)	0 ^a
Firm age		.006 (.020)	0 ^a
Firm ownership		.204 (.445)	– .006.530
Entrepreneur age		– .016 (.015)	0 ^a
Entrepreneur gender		.253 (.318)	1.975 2.514
Market segment 1: wood		– .027 (.413)	.196 .500
Market segment 2: pottery		.674 (.464)	1.452 .571)**
Market segment 3: stone		.717 (.627)	1.056 .926
Market segment 4: paper and plastic		– .073 (.532)	.465 .604
Market segment 5: wickerwork		.879 (.505)*	2.046 .676)**
Market segment 6: leather		.139 (.484)	.926 .562)*
Market segment 7: metal/silver		.093 (.514)	.285 .621
ACAP × Interaction global buyers			– .067 .170
ACAP × Transactional dependence			2.216 .838)**
ACAP × Clients control brands			– .833 .614
ACAP × Clients control designs			.403 .160)*
ACAP × Roles			.351 .515)*
ACAP × Interactions local firms			– .027 .171
ACAP × Interactions non-firms			– .120 .294
ACAP × Training			– 1.116 .520)*
ACAP × Observe			– .604 .173)***
Case (Yogyakarta) × gender			– 1.781 2.592
Case (CapeTown) × gender			– 1.491 2.544
Case (Yiwu) × gender			0 ^a



Table 8 (continued)

	Model 1 Independent variables	Model 2 Independent and control variables	Model 3 Variables and interaction effects
Case (Yogyakarta) × firm size			− 1.426 .711)*
Case (Cape Town) × firm size			.109 .352
Case (Yiwu) × firm size			1.688 .937)*
Case (Yogyakarta) × age firm			− .045 .046
Case (Cape Town) × age firm			.046 .042
Case (Yiwu) × age firm			− .153 .086
Case (Yogyakarta) × entrepreneur age			.009 .033
Case (Cape Town) × entrepreneur age			− .062 .025)*
Case (Yiwu) × entrepreneur age			.025 .033
Observations	194	182	182
Pseudo R^2	.459	.498	.825 ^b
Model significance	.000	.000	.000

Link function: ordered probit regression. Estimates given and standard error in parentheses

ACAP Absorptive capacity

* $p < 0.10$; ** $p < 0.01$; *** $p < 0.001$

^aThis parameter is set to zero because it is redundant

^bCox and Snell, because Nagelkerke is not calculated properly

groups and cut off points. They show similar results, whereby the models using a low level of product innovation as reference group has the highest robustness. We opt to compare to a high level of product innovation (new to the world), as this is easiest to interpret.

Models 3 of Tables 8 and 9 offer the most complete analysis with all indicators and interaction effects. When all interaction effects are included, however, the models lack degrees of freedom, are over-fitting and have relatively many missing variables. We are therefore selective. As our conceptual framework depicts absorptive capacity as mediation variable, we add the interaction effects between absorptive capacity and indicators of the GVC/IS. Furthermore, it is likely that the location of firms in case studies interacts with control variables such as firm-size (for instance: being a large firm in Yiwu may increase odds of process innovation). We have run models with other potential interaction effects (i.e. interactions between indicators of GVCs, ISs and control variables), but these did not yield significant results.

The study findings show that various factors increase the odds of product innovation in three or more of the models. The location of a firm in a specific case study appears to have the most significant effect, as indicated by the relatively high marginal effects and significance. As expected, odds of product innovation also increase when the local firm brands its products itself (Gereffi et al. 2005). As also expected, a higher level of absorptive capacity also increases the odds of product innovation (Zahra and George 2002). Table 8 model 3 furthermore shows that absorptive capacity might interact with indicators of the GVC and IS. However, none of these interaction effects are robust and more research is needed.



Table 9 Probit regression on product innovation

	Model 1 Independent variables	Model 2 Independent and control variables	Model 3 Variables and interaction effects
Thresholds			
Process innovation: low	.204 (.772)	4.738 (2.018)**	5.745 2.395)**
Locations			
Case: Yogyakarta	– .341 .287	– .109 (.509)	5.773 2.603)*
Case: Cape Town	– .977 .491)*	– .497 (.928)	– 25.523 39.255
GVC Interaction buyers	– .033 .102	– .031 (.148)	.038 .196
GVC Brand (clients)	.903 .331)**	1.744 (.600)**	3.218 1.201)**
GVC design	– .040 .096	– .065 (.136)	– .104 .177
Role	– .003 .342	.051 (.654)	– .972 1.042
Transactional dependence	– .271 .389	– .704 (.640)	1.013 1.010
IS firms	.004 .105	– .089 (.173)	0 ^a
IS factor non-firms	– .021 .135	– .388 (.241)	– .518 .277)*
Training	.354 .280	.359 (.439)	.130 .535
Observe	.012 .043	.019 (.052)	.053 .067
Absorptive capacity factor	– .110 .145	.090 (.262)	.218 1.363
Firm size		– .009 (.305)	0 ^a
Firm age		.054 (.033)*	0 ^a
Firm ownership		– 1.685 (.624)**	– 1.921 .768)**
Entrepreneur gender		.262 (.541)	0 ^a
Entrepreneur age		.001 (.024)	0 ^a
Market segment 1: wood		1.288 (.740)*	1.349 .787)*
Market segment 2: pottery		1.776 (.865)*	1.779 .958)*
Market segment 3: stone		1.479 (1.012)	1.768 1.049)*
Market segment 4: paper and plastic		2.273 (.770)**	2.324 .883)**
Market segment 5: wickerwork		2.209 (.803)**	2.234 .838)**
Market segment 6: leather		1.867 (1.004)*	1.480 1.051
Market segment 7: metal/silver		1.734 (.906)*	2.462 1.116)*
ACAP × Interaction global buyers			.040 .144
ACAP × Transactional dependence			.110 .709
ACAP × Clients control brands			– 1.807 1.165
ACAP × Clients control designs			.206 .159
ACAP × Roles			.234 1.017
ACAP × Interactions local firms			.039 .158
ACAP × Interactions non-firms			0 ^o
ACAP × Training			.752 .481
ACAP × Observe			– .268 .205
Case (Yogyakarta) × gender			0 ^a
Case (CapeTown) × gender			0 ^a
Case (Yiwu) × gender			0 ^a



Table 9 (continued)

	Model 1 Independent variables	Model 2 Independent and control variables	Model 3 Variables and interaction effects
Case (Yogyakarta) × firm size			0 ^a
Case (Cape Town) × *firm size			0 ^a
Case (Yiwu) × firm size			0 ^a
Case (Yogyakarta) × age firm			.079 .038)*
Case (Cape Town) × age firm			.038 .228
Case (Yiwu) × age firm			.066 .059
Case (Yogyakarta) × entrepreneur age			– .147 .065
Case (Cape Town) × entrepreneur age			.413 .581
Case (Yiwu) × entrepreneur age			0 ^a
Observations	190	182	182
Pseudo R^2	.238	.504	.623
Model significance	.003	.000	.000

Link function: ordered probit regression. Estimates given and standard error in parentheses

ACAP absorptive capacity

* $p < 0.10$; ** $p < 0.01$; *** $p < 0.001$

^aThis parameter is set to zero because it is redundant

Table 9 applies an ordered probit regression model in assessing the odds of process innovation. Using the same model enables comparability. We find that the model on process innovation is considerably weaker than that of product innovation (lower model strength and R^2). The location of a firm in a case study also influences the odds of process innovation in the three models, but the results are weaker than those on product innovation. Other factors that increase the odds of process innovation are when the clients control brands and when firms are owned by foreigners (including foreign firms). In addition, the odds of process innovation are significantly higher when firms specialise in one market segment than when they produce products in most or all market segments (except when they produce leather or stone products). We find that most interaction effects do not affect the odds of process innovation.

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